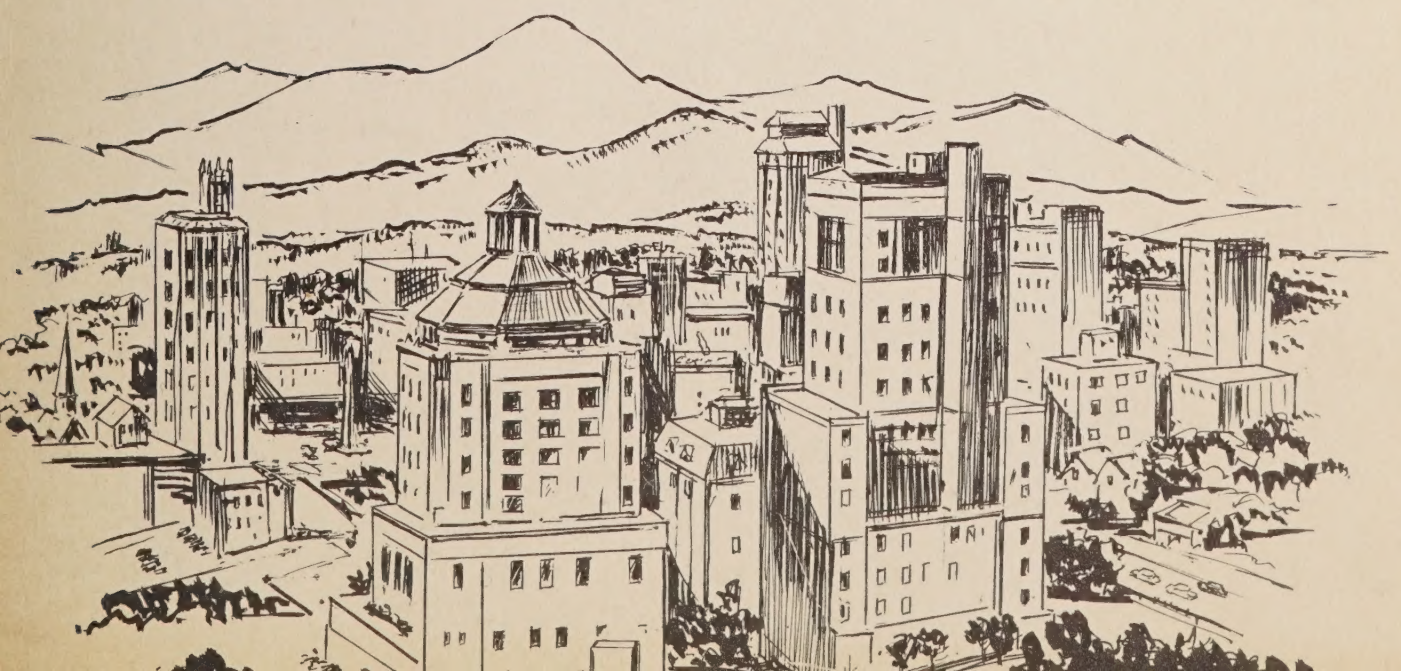


# ASHEVILLE - BUNCOMBE TECHNICAL INSTITUTE







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# **ASHEVILLE - BUNCOMBE TECHNICAL INSTITUTE**

**340 Victoria Road**

**Asheville, N. C.**

## **Catalogue of Courses Day and Evening School**

**Volume 2  
1964-1965**

# School Calendar

1964-65

## FALL QUARTER

Registration ..... September 8

Classes Start ..... September 9

Classes End ..... November 25

Total number of class days: 56

Thanksgiving Holidays—November 26 and 27

## WINTER QUARTER

Registration ..... December 1

Classes Start ..... December 2

Classes End ..... February 26, 1965

Total number of class days: 56

Christmas Holidays—December 24 through January 3, 1965

## SPRING QUARTER

Registration ..... March 3

Classes Start ..... March 4

Classes End ..... May 26

Total number of class days: 57

Easter Holidays—Good Friday, April 16, Easter  
Monday, April 19

Vocational-Technical Education Conference  
May 31 through June 2

## SUMMER QUARTER

Registration ..... June 3

Classes Start ..... June 4

Classes End ..... August 20

Total number of class days: 56

Independence Day holiday ..... Monday, July 5



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(with farm machinery option)	
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# ADMINISTRATION

I. E. Ready ..... Director, Department of Community Colleges  
Ivan E. Valentine ..... Assistant Director of Vocational-  
Technician Programs

## STATE BOARD OF EDUCATION

William D. Herring, Chairman	C. W. McCrary
Edwin Gill, State Treasurer	George Douglas Aitken
Charles F. Carroll	R. Barton Hayes
J. A. Pritchett	John M. Reynolds
Charles E. Jordan	Guy B. Phillips
Charles G. Rose, Jr.	H. L. Trigg

## BOARD OF TRUSTEES

L. F. Zerfoss, Chairman	American Enka Corporation
J. Gerald Cowan, Vice-Chairman	Wachovia Bank Building
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## ADMINISTRATIVE STAFF

Thomas W. Simpson	President
Harvey L. Haynes	Dean of Instruction
John W. Davis	Director of Student Personnel
B. C. Adams	Director of Evening Programs
J. B. Edwards, Jr.	Director of Extension
James R. Cox	Director of General Adult and Community Service Programs
Mrs. Jane G. Smith	Secretary to the President
Mrs. Jessie P. Goforth	Secretary
Mrs. Barbara Kitchens	Secretary
Mrs. Edna Foster	Receptionist
Miss Frances Nelson	Secretary

## FOREWORD

Recent advancements in atomic energy, automation, guided missiles, and the advancing era of the push button are the results of the engineer working hand-in-hand with the technician and the skilled tradesman.

It is believed by many that our civilization, as well as our national defense, is dependent upon technology. The need for men and women with trade and technical skill grows more acute as time passes. To provide the type of education so necessary for future scientific advances, industrial progress, and national defense, The Asheville-Buncombe Technical Institute offers a variety of programs, both day and evening, designed to meet the needs of youth and adults of Western North Carolina.

Thomas W. Simpson  
President



## OBJECTIVES

It has been said that technical education is knowledge in action. Objectives of the Asheville-Buncombe Technical Institute embody the belief that the most meaningful knowledge is that which can be put to productive use.

Our objectives are envisioned as specific goals established to enlarge the potential of the individual student through education in the knowledge, skills, and attitudes which will be useful to him and thus to his employer. The Institute will provide instruction in numerous special fields to meet the demands of an industrial community, but it will not ignore its responsibility to equip students with the ability to think creatively and abstractly. In addition, certain courses which place emphasis on an understanding of the American free enterprise system and develop interest in the betterment of mankind are common to all areas of study.

Our aims reflect a firm philosophy that education should equip every individual, insofar as his capacity permits, with the competence to attain his economic, social, intellectual, and spiritual goals in a democratic society. Physical and mental skills will be developed to the end that each student, as he trains and works in the various occupations, will be able to contribute to the maintenance, improvement, and defense of our American way of life.



# HISTORY, LOCATION, AND PURPOSE

In 1957 the North Carolina State Legislature made possible a program of increased technical training through the formation of Industrial Education Centers. It was felt if North Carolina was to achieve its rightful position in the expanding industrial and technological era, well equipped training centers would be needed to prepare the youth of today to meet the demands of present industry and industries that will locate in our state in the future.

After thorough surveys, both state and local, and a complete analysis of the present needs and future trends of technical and industrial training, Asheville was selected as one of the twenty locations for Industrial Education Centers.

In 1959 the people of the City of Asheville and County of Buncombe approved in a bond election \$300,000 to be used in the construction of two buildings.

The spring of 1963 brought on the first major expansion of facilities. A third building was approved and a \$200,000 loan from the State Literary Fund to the County was made possible. An individual board of trustees was appointed to meet the requirements of the new law passed in the summer of 1963. The new law removed the Center from the State Department of Public Instruction and placed it under the direction of the newly created Department of Community Colleges. The board of trustees requested that the Asheville center be made into a technical institute. This request was approved by the State Board of Education in January, 1964, and the name of the center was changed to Asheville-Buncombe Technical Institute.

## LOCATION

The Asheville-Buncombe Technical Institute is located in three modern buildings on a twenty-one acre tract of land off Victoria Road. The entire 50,000 square feet of floor space is specifically designed to house a Trade and Technical program. Included in the buildings are well-lighted classrooms, large laboratories and shops equipped with the most recent test and production type equipment.

## PURPOSE

The purpose of the Institute is to provide Trade and Technical training for qualified students, both youth and adult. The program is designed to impart profitable skills to the untrained or increase the knowledge of those already trained. The Institute will serve the principal objective to prepare students through practical training to meet the demands of a modern industrial society.



# AREAS OF STUDY

## TECHNICAL DIVISION

Courses offered in the technical division are designed to meet an increasing demand for high level industrial skills in North Carolina. Students entering the Technical division are required to meet educational and aptitude standards appropriate to the course chosen. Such standards require a firm educational base and a level of maturity expected of adults.

Students who successfully complete courses in this division will be prepared to offer prospective employers the training, knowledge, and skill necessary to work as an Industrial Technician. More time will be required to attain such a degree of proficiency than would be necessary in the less exacting trade courses. Applicants for the technical division will therefore be urged to enroll for the full-time program.

## TRADE DIVISION

Courses in the trade division place emphasis on training in those manipulative and mental skills applicable to the particular curriculum in which the student is enrolled. Students work under close supervision to obtain skills on a level acceptable to industry.

## EXTENSION DIVISION

The extension division offers avenues of learning to those men and women who, though employed, seek to upgrade, update, and generally enhance their individual knowledge and performance. Most curriculums in the technical and trade divisions will be offered on an extension level.

Included in this division are short term courses designed as specific courses for upgrading and updating. Also included in this division are supervisory-level courses designed to stimulate those individuals who aspire to advance their knowledge in the fields of management.

Special classes, both day and night, may be provided to accommodate such students.



# ADMISSION PROCEDURE AND REQUIREMENTS

## GENERAL REQUIREMENTS

Any North Carolina citizen may be enrolled in a course if he meets the admission requirements. Such requirements will necessarily depend upon the course of study chosen. The applicant must be sixteen years of age or older and must possess certain basic aptitudes and interests. No applicant may enroll in more than one curriculum.

The applicant should be in reasonably good health with no impairment of vision or physical defect that would restrict his ability in a particular field of work. The applicant may under certain conditions be required to furnish evidence of satisfactory health.

The Institute is co-educational, and its program is not restricted to high school graduates. Technicians level students must, however, possess the qualities and maturity of high school graduates. Technician level students must have completed two years of high school mathematics, including one year of algebra. Physics and chemistry are also desirable prerequisites for students entering the school of technology.

Educational background, experience, and aptitudes will all be considered when an application is made to the Center.

## ADMISSION PROCEDURE

Persons wishing to take courses at the Institute must file an application for admission. Application forms may be obtained by writing or calling the Institute on Victoria Road. The telephone number is 254-8185. A transcript of courses and grades from the last school attended must be on file with the Institute before an application is considered complete.

While application for enrollment may be made at any time preceding the anticipated date of entry, it is strongly recom-

mended that this be done at least thirty days prior to such date. Sufficient time will thereby be allotted for necessary testing, counseling, and proper evaluation of results.

All pre-employment students will be required to take the General Aptitude Test Battery administered by the North Carolina Employment Security Commission. Individuals outside of Buncombe County may arrange to take this aptitude battery at the Employment Office nearest them. After the completed application form is received and the results of the aptitude test evaluated, a counseling session will be arranged with each applicant. A letter of acceptance will be given at least two weeks in advance to the first day of the course. No application will be considered complete until all requested information has been supplied and until a personal interview has been completed with either the President or Counselor.

## ADMISSION WITH ADVANCE STANDING

The Asheville-Buncombe Technical Institute will accept work and give credit for work completed in other Industrial Education Centers, Technical Institutes, or Colleges. Applicants for admission with advanced standing should make application as a regular applicant and submit a transcript of work from prior schools. Acceptance of such work will be at the discretion of the President.



# DEGREES, DIPLOMAS AND CERTIFICATES

## DEGREE PROGRAM DEFINED

The Asheville-Buncombe Technical Institute will confer an Associate in Applied Science degree in certain approved Technical Curricula. Other Technical level curricula will grant a state diploma. A state comprehensive examination will be required before graduation in any Technical curriculum. Both the degree and diplomas are awarded in the name of the North Carolina State Board of Education.

## DIPLOMA COURSES DEFINED

The Asheville-Buncombe Technical Institute will grant diplomas in the name of the North Carolina State Board of Education on successful completion of any trade level curricula. A state comprehensive examination will be required before graduation in any trade level curriculums.

## CERTIFICATES

Certificates will be issued in the name of the Asheville-Buncombe Technical Institute to students who successfully complete any short term program or course.

## Fees

Registration Fee (all students, regardless of course).....\$ 2.00  
Tuition:

Full-time students, per month .....\$10.00

Part-time students (per credit hour), per quarter ---\$ 2.00

In addition to the fees above, students must purchase prescribed textbooks for each course.

## Student Insurance

Certain risks are inherent in any work involving regular contact with mechanical and electrical equipment. While stringent precautions will be taken to insure safety, it is felt to be in the interest of all students to provide some measure of insurance protection.

A group policy providing the desired insurance protection will be maintained in effect by the Institute and all students will be **REQUIRED** to subscribe to such coverage. The cost of accident insurance to the student will be approximately \$2.50 per year.

## Withdrawals

Any student who must withdraw because of illness or personal hardship may, if his work is deemed satisfactory at the time of withdrawal, re-enter the course as a beginning student provided that such action is taken upon the immediate next offering of the course.

A student may be dismissed from school for failure to achieve a passing grade for two grading periods or for infraction of the rules that apply to student conduct. Re-entrance of dismissed students will be at the discretion of the President. A failing grade for one report period will automatically place the student upon probationary standing for the following report period.

## Refunds

No refunds will be made to students who withdraw without authority or who are dismissed for cause.

Students who are given permission to withdraw will receive a refund of their Instructional supply fee on a prorated basis.

## Attendance Requirements

Only excused absences will be permitted. Unexcused absences will be entered as "O" for the daily work. Three consecutive unexcused absences will subject a student to dismissal. An accumulation of unexcused absences will also subject the student to dismissal.

Some evidence as to cause of absence may be required for excused absence.

## Student Conduct

Students will be expected to conduct themselves at all times as individuals of prudence and maturity. The rights and feelings of others will be respected. Each student shall demonstrate a high regard for school facilities and property and for the personal property of others.

School regulations which serve to control such activities as vehicle traffic and parking, smoking, loitering, and other aspects of personal conduct must be stringently observed.

Students may be promptly dismissed for conduct which is considered incompatible with standards of propriety and good judgment.



## Grading System

Grades will be issued to all students who are failing at mid-term and final grades will be issued at the end of the term to all students. Students will be graded on the acquirement of technical skills, ability to work under supervision, interest in work, initiative, and the ability to apply related information.

Students enrolled in either the school of Technology or the school of Trades will be graded by the following system.

A	93 - 100	Excellent
B	86 - 92	Above Average
C	78 - 85	Average
D	70 - 77	Passing
F	Below 70	Unsatisfactory
WP	Withdrawal passing	
WF	Withdrawal failing	
I	Incomplete	

Incomplete: Assigned when a student is unable to complete his work or take a final examination because of illness or for other reasons over which the student has no control. This grade is given only with the approval of the Director of Student Personnel. An "incomplete" must be removed within the first six weeks of the next term in which the student is enrolled. Otherwise, the grade becomes an "F."

## Additional Counseling and Testing

As mentioned under admission procedure, all applicants will be required to be subjected to a series of aptitude tests. This will be accomplished prior to acceptance and registration. The counselor will schedule interviews with students concerning interpretation of their test scores and he will advise students concerning course selections. Additional aptitude tests may be desirable to determine individual ability. Applicants are not encouraged to enroll unless it is believed that the student has made a sound choice and that he will profit from his choice.

Students are encouraged to use the counseling services at any time. The counseling service will work at all times with individuals to keep them informed of the progress they are making. Also, many reference materials are made available to students during the training program through the counseling service.

## Placement Service

The Institute provides placement service by working with the Employment Security Commission which will assist the students and alumni in securing employment. The objective of this service is to guide and assist the student and graduate in obtaining the type of position for which he is best qualified.

Active contacts are maintained throughout North Carolina with industries. Informative booklets, brochures, and industrial directories are available to students and alumni in the Institute's library, and group and individual job interviews will be arranged.

## Library

A technical library is maintained by the Asheville-Buncombe Technical Institute for use by faculty and students. The library contains scientific and technological volumes as well as subject matter materials in all related fields and several current periodicals. New volumes are being added every quarter in order to keep abreast with technological advancements.

## Student Lounge

A refreshment and lounge area equipped with a variety of modern vending machines is provided for the convenience of students and faculty. Foods and drinks may not be carried into a classroom, shop, or laboratory.



# School of Engineering Technology

The following areas of study are included in the school of engineering technology.

Data Processing Technology

Drafting and Design Technology

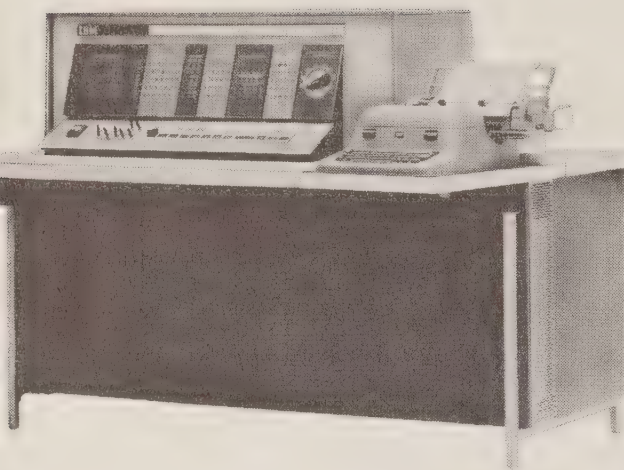
Electronics Technology

Chemical Technology

All of the Curriculums in the school of engineering technology are six quarters in duration and will require about twenty-five to thirty hours per week in classroom and laboratory work. If a student elects to enroll in the school of engineering technology through extension because of his work load, the time required for completion will double. The extension division will offer fifteen hours per week in a particular area of study.

In addition to the regular classroom work each student will be required to spend additional time on outside assignments. The school of engineering technology will also require each student to demonstrate an ability to do research as it relates to original thinking.

Certain courses are required of every student irrespective of the curriculum area. These courses are core courses and will serve as related areas of study in addition to the subjects required by the curriculum.



## DATA PROCESSING TECHNOLOGY

The data processing courses are arranged in a workable sequence suitable to the instructional needs of the students with an appropriate balance between technical courses, general education courses, and laboratory exercises. The arrangement of the curriculum is such that it proceeds from elementary work to work that is more complex. Within the subject material of each course the concepts are solidified through practical application. The outline below is the business approach; however, it is possible for the student to elect certain subjects and study in the scientific area of data processing.

### OCCUPATIONAL OPPORTUNITIES

Typical occupational opportunities are found in banking, civil service, industry, business, and insurance companies. Research activities also utilize trained persons in this field.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>
<b>First Quarter</b>				<b>Fourth Quarter</b>			
MA 311 Numbering Systems and Boolean Algebra	5	0	5	DP 314 Scientific Programming	2	4	4
DP 310 Functional Wiring Principles	4	6	7	BUS 322 Accounting	5	2	6
BUS 309 Business Machines	0	4	2	MA 315 Statistics	5	0	5
DP 311 Introduction to Data Processing Systems	3	2	4	ENG 304 Communicative Skills-Speech	2	0	2
ENG 301 Reading Improvement	2	0	2	MA 316 Calculus	3	0	3
Total	14	12	20	Total	17	6	20
<b>Second Quarter</b>				<b>Fifth Quarter</b>			
MA 312 Algebra	5	0	5	BUS 323 Cost Accounting	4	2	5
DP 312 Fundamentals of Programming	5	0	5	DP 315 Linear Programming	2	4	4
BUS 320 Accounting	5	2	6	SOC 302 Economics	3	0	3
ENG 302 Communicative Skills-English	3	0	3	CHEM 301 General Chemistry	3	2	4
ISc 301 Industrial Organization and Management	3	0	3	ELEC 309 Electrical Fundamentals	3	2	4
Total	21	2	22	Total	15	10	20
<b>Third Quarter</b>				<b>Sixth Quarter</b>			
MA 313 Trigonometry	5	0	5	BUS 318 Business Law	5	0	5
DP 313 Business Programming	2	4	4	BUS 324 Machine Accounting Problems	0	4	2
BUS 321 Accounting	5	2	6	BUS 325 Practical Accounting Problems	0	10	5
MA 314 Statistics	5	0	5	DP 316 Research	5	4	7
ENG 303 Communicative Skills-Tech. Writing	3	0	3	SOC 301 Human Relations	2	0	2
Total	20	6	23	Total	12	18	21



# DATA PROCESSING

## Course Descriptions

### MA 311 NUMBERING SYSTEM AND BOOLEAN ALGEBRA

A cursory treatment of our present numbering system; development of new systems; transformation from one system to another; fundamental operation in systems other than the decimal; a detailed study of the binary system in relation to machine calculations; principles of Boolean Algebra and its contribution to digital devices and data processing. Prerequisite: None.

### DP 310 FUNCTIONAL WIRING PRINCIPLES

The fundamental principles of wiring necessary to perform basic machine functions of printing, punching, comparing, and selection. A series of laboratory experiments support the theoretical aspects of this course. Prerequisite: None.

### BUS 309 BUSINESS MACHINES

Designed to serve as a general survey of the entire field of business and office machines. Students will receive training in techniques, processes, operation, and application of 10 key adding machine, full-keyboard adding machine, calculator, posting and accounting machines, IBM card punch, and IBM card verifier.

### DP 311 INTRODUCTION TO DATA PROCESSING SYSTEMS

A study of the fundamental concepts and operational principles of data processing systems. They are presented as an aid in developing a basic knowledge of computers as a prerequisite to the detail study of particular computer problems. This course also provides a general knowledge of computing systems and is a prerequisite for all programming courses. Prerequisite: None.

### MA 312 ALGEBRA

A study of fundamental operations in algebra, exponents and radicals; functions and graphs; linear equations; simultaneous linear equations; quadratic equations; simultaneous quadratic equations; ratio, proportion, and variation; binomial theorem; progressions, and logarithms. Prerequisite: (Entrance Requirements).

### DP 312 FUNDAMENTALS OF PROGRAMMING

The student will study the functions and capabilities of a specific data processing machine and will become familiar with some of the tools and raw material necessary for becoming a programmer. Programming drills, exercises, and case studies will serve to bridge the gap from the theoretical to the real world of data processing. Prerequisites: DP 310, DP 311.

### BUS 320 ACCOUNTING

This course emphasizes the principles, techniques, and tools of accounting. It provides the necessary background understanding of the mechanics of accounting — collecting, summarizing, analyzing, and reporting information about the business. A thorough study is made of both service

and mercantile enterprises and will include a practice set which will provide practical application of the principles learned. Prerequisite: None.

### MA 313 TRIGONOMETRY

A study of the trigonometric functions; radian measure; fundamental identities; trigonometric equations; logarithms of trigonometric functions; solution of right and oblique triangles with and without logarithms; inverse trigonometric equations; and graphical representation of the trigonometric functions. Prerequisite: MA 312.

### DP 313 BUSINESS PROGRAMMING

The effective use of data processing equipment in meeting the information needs of business; utilizing the symbolic programming system as a tool in the solution of problems. This course is designed to guide the student through the stages in the evolution of a system. The scope of the system developed will vary from a modest payroll procedure to the total information system of a large and complex business. Prerequisites: DP 312, MA 312.

### BUS 321 ACCOUNTING

Partnership and corporate forms of business including a study of payrolls, Federal and State taxes. Emphasis is placed on recording, summarizing, and interpreting data for management control rather than on bookkeeping skills. Accounting services are shown as they contribute to the recognition and solution of a management problem. Prerequisite: BUS 320.

### MA 314 STATISTICS

The theory of statistics and its application in modern business. The student will gain an understanding of the kinds of regularity that exist among random fluctuations. He will gain experience in associating and using mathematical models to interpret physical phenomena and predicting, with reasonable certainty, the outcomes of experiments related to practical business problems. Prerequisite: MA 312.

### DP 314 SCIENTIFIC PROGRAMMING

Designed to provide the student with sufficient knowledge of programming systems concepts so that he may easily master any specific system with a minimum of instruction. He will analyze, evaluate, and make minor modifications to such systems. Individual phases of certain selected systems are treated in detail in order that the student may learn advanced programming and logic decision techniques as applied in sophisticated systems. Prerequisites: DP 313, MA 313.

### BUS 322 ACCOUNTING

The student is given a thorough knowledge of concepts used in the preparation and interpretation of financial statements. Each item of the income statement and balance sheet is carefully analyzed prior to making a selection as to how these items will be utilized. Prerequisite: BUS 321.

### MA 315 STATISTICS

A continuation of MA 314. There will be practical experiences in the statistical solution of business problems through the use of computers. Methods of organizing and presenting data with intelligent interpretations are emphasized throughout this course. Prerequisite: MA 314.



## MA 316 CALCULUS

A course designed to familiarize the student with fundamental concepts of differential and integral calculus; standard formulas for differentiating standard integration formulas; algebraic and trigonometric functions; use of integral tables; and various applications not requiring a knowledge of analytic geometry. Prerequisite: MA 313.

## BUS 323 COST ACCOUNTING

An understanding of the basic concept of the cost accounting function within a manufacturing organization. Material costs, labor costs, manufacturing overhead, and marketing cost that enter the cost accounting system are treated in detail. Prerequisite: BUS 322.

## DP 315 LINEAR PROGRAMMING

Lecture and case problems encompassing the scope and potential of using mathematical programming with computers to increase industrial efficiency. This course presents the network technique of management planning, scheduling, and control. Basic rules of network planning are presented with laboratory assignments designed to implement the theoretical aspects of Critical Path Method (CPM)). Prerequisites: DP 314, MA 316.

## SOC 302 ECONOMICS

The fundamental principles of economics including institutions and practices by which people gain a livelihood. Included is a study of the laws of supply and demand and the principles bearing upon production, exchange, distribution, and consumption both in relation to the individual enterprise and to society at large. Prerequisite: None.

## BUS 318 BUSINESS LAW

An understanding of basic business laws as they relate to business. The law of contracts, negotiable instruments, agency, partnership, corporation, deeds of conveyance, etc. will be covered as they regulate the relations of one business to another as well as laws that control relations of an enterprise with its employees and/or its customers. This course is no more than a skeleton outline of principles and a limited number of illustrations of these principles. Prerequisite: None.

## BUS 324 MACHINE ACCOUNTING PROBLEMS

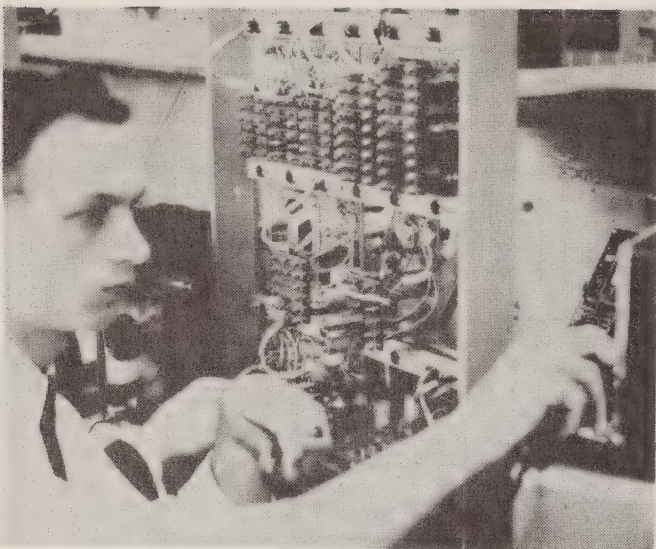
This course is designed to interweave the student's knowledge of electronic data processing equipment and his knowledge of accounting theory. It is a practical approach to the use of electronic machines in the solution of accounting problems. Prerequisites: BUS 323, DP 313.

## BUS 325 PRACTICAL ACCOUNTING PROBLEMS

The individual is introduced to a practical accounting problem. The student will be required to maintain business and accounting records showing daily transactions of a small business. The evaluation of the student's performance during this period will be a co-operative effort engaged in by locally assigned business personnel and faculty members. The primary purpose of this session is to give the student an overview of practical accounting procedures. Prerequisite: BUS 323.

## DP 316 RESEARCH

Individual assignments in a carefully selected project will be assigned to the student during this quarter of work. It will give the student an opportunity to initiate and carry out a project taken from outside the school. This course places the responsibility upon the student to solve a significant problem with minimum of teacher assistance. Prerequisites: DP 315, BUS 323.



## ELECTRONICS TECHNOLOGY

The electronic technology curriculum provides a broad theoretical and practical program of training for those who seek careers in the giant electronic industries. Special equipment is used by the instructor to present circuits of complicated electronics theory in step by step demonstration. In the laboratory the students develop skills in the use of modern electronic testing equipment and measuring instruments. Analysis of circuits, construction of electronic components, and theory of circuit design will be a major part of the laboratory work.

The related subjects will include applied physics, industrial economics, mathematics, technical reports, materials and processes, industrial organization, and technical drawing.

## OCCUPATIONAL OPPORTUNITIES

Electronic Distributor Representative, Civil Service Electronics Inspector, Missile and Rocket Control Technician, Lab worker, Medical Electronics, and Radar Technician.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>
<i>First Quarter</i>				ELN 312 Electronics I	5	8	9
MA 301 Technical Mathematics	5	0	5		15	8	19
PHY 301 Physics: Properties of Matter	3	2	4	<i>Fourth Quarter</i>			
ENG 301 Communicative Skills: Reading Improvement	2	0	2	MA 304 Technical Mathematics	3	0	3
DD 307 General Drafting	2	3*	3	PHY 304 Physics: Light and Sound	3	2	4
ELEC 310 Direct Current Electricity	5	6	8	ENG 304 Communicative Skills: Speech	2	0	2
	17	11	22	ELN 313 Electronics II	8	8	12
<i>Second Quarter</i>					16	10	21
MA 302 Technical Mathematics	5	0	5	<i>Fifth Quarter</i>			
PHY 302 Physics: Work, Energy, Power	3	2	4	ISc 301 Industrial Organization and Management	3	0	3
ENG 302 Communicative Skills: English	3	0	3	ELN 316 Transistor Applications	5	4	7
ELEC 311 Alternating Current Electricity	5	6	8	ELN 317 Communications Ultra High Frequency	2	4	4
	16	8	20	ELN 318 Special Circuitry	5	4	7
<i>Third Quarter</i>					15	12	21
MA 303 Technical Mathematics	5	0	5	<i>Sixth Quarter</i>			
ENG 303 Communicative Skills: Technical Writing	3	0	3	SOC 302 Economics	3	0	3
SOC 301 Human Relations	2	0	2	ELN 319 Instrumentation	5	6	8
				ELN 320 Circuit Analysis and Maintenance	5	6	8
					13	12	19

\* "Manipulative laboratory" involves development of skills and job proficiency. Credit of one quarter hour for each three hours of laboratory.



# INDUSTRIAL ELECTRONICS

## Course Descriptions

### ELEC 310 ELECTRONICS

An introductory course in basic electricity. Subjects include: Structure of matter, electrical terminology and symbols, electron theory of current flow, magnets and magnetic fields. Rigorous mathematical analysis of D. C. resistive circuits is provided through application of Ohm's Law, Kirchhoff's Laws, Thevenin's Theorem, Norton's Theorem, The Superposition Principle, and Loop Current Method, in the solution of complex resistive networks. Fundamental principles of Inductors, Capacitors, and Time Constants Circuits are introduced.

### ELEC 311 ELECTRONICS

Alternating current and voltage: This course is an introduction to, and a study of, A. C. theory. Mathematical analysis is made of both sine and non-sine wave forms. Inductive reactance, capacitive reactance, and impedance characteristics of A. C. circuits are investigated. The use of vector and complex numbers in circuit impedance is studied. Series and parallel resonant circuit conditions are compared and practical application of these conditions explained. Prerequisite ELN 310

### ELN 312 ELECTRONICS

A treatment of electron tubes, semi-conductors and their associated circuitry: Thermionic emission, the diode, triode, tetrode, and pentode characteristics are examined. Theory of semi-conductor diode and transistor operation is studied in detail. Application of both vacuum tubes and semi-conductors in power supplies, voltage amplifiers, power amplifiers, and the advantages and disadvantages of each considered.

### ELN 313 ELECTRONICS

A course in design and analysis of circuitry introduced in electronics ELN 312 with the addition of oscillator circuits, RF and IF amplifiers. Frequency response, stage gain, distortion, and noise characteristics of amplifiers are determined. Oscillator design, frequency stability, tank circuit design, frequency multipliers, and transistor oscillators are explored. Prerequisites ELN 312.

## ELN 316 TRANSISTOR APPLICATIONS

This course provides additional appreciation of transistor circuitry and the design problems unique to transistors: Included are junction diodes, transistor triodes, tunnel and zener diodes with associated circuitry. The effect of temperature variation, transit time, frequency response is studied in detail. Prerequisite ELN 314-315.

## ELN 317 COMMUNICATIONS AND ULTRA HIGH FREQUENCY

A course in application of previously studied circuits to the broad field of communications and UHF. AM and FM transmitters, AM and FM receivers, wave guides, cavity resonators, klystron, magnetron, and traveling wave tubes are discussed.

## ELN 318 SPECIAL CIRCUITRY

The design and analysis of special circuitry: Included are wave shaping, pulse techniques, broad band amplifiers, diode switches, multivibrators, gates, magnetic amplifiers, chopper amplifiers, clipper and clamping circuits, synchro and servo systems, photo control devices, step counters, and other specific application circuitry.

## ELN 319 INSTRUMENTATION

A basic study of sensory devices for detecting changes in pressure temperatures, sound, light and electricity; the associated circuitry and indicating devices.

## ELN 320 CIRCUIT ANALYSIS AND MAINTENANCE

Systematic analysis of complex circuitry. Methods of locating and correcting malfunctions. Troubleshooting by voltage measurements; resistance measurements, and waveform observations. Schematic reading and interpretation.

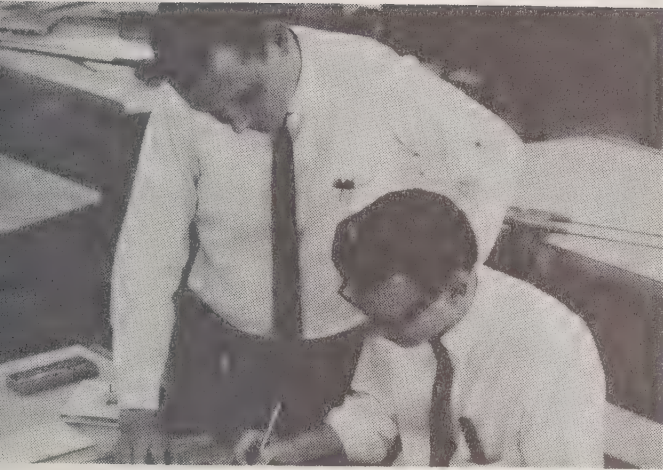


## DRAFTING AND DESIGN TECHNOLOGY

The Curriculum for Drafting and Design has been designed to provide optimum specialized technician instruction in a two year program.

The courses are arranged in a sequence that gives the student the required technological and specialized courses as they are needed to coordinate his laboratory experiences.

The curriculum is designed to qualify the graduate for performance of duties in the field of mechanical drafting and design requiring the application of engineering principles, but as applied to the technical rather than the engineering field. As the student develops in drafting skills, mathematics, and related science, a gradual shift is made in the curriculum applying these skills to practical problems in design.



## OCCUPATIONAL OPPORTUNITIES

Typical job opportunities are found in the areas of state government, civil service, construction companies, industries, engineering consulting firms, and architectural firms.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>
<i>First Quarter</i>				<i>Third Quarter</i>			
DD 301 Technical Drafting .....	2	6	4	DD 303 Technical Drafting .....	2	6	4
MA 301 Technical Mathematics .....	5	0	5	MA 303 Technical Mathematics .....	5	0	5
ENG 301 Communicative Skills: Reading Improvement .....	2	0	2	ENG 303 Communicative Skills: Technical Writing .....	3	0	3
PHY 301 Physics: Properties of Matter	3	2	4	PHY 303 Physics: Electricity .....	3	2	4
MECH 301 Materials, Tools, and Processes..	2	2	3	MECH 303 Materials, Tools, and Processes	2	2	3
Totals .....	14	10	18	Totals .....	15	10	19
<i>Second Quarter</i>				<i>Fourth Quarter</i>			
DD 302 Technical Drafting .....	2	6	4	DD 304 Technical Drafting .....	2	6	4
MA 302 Technical Mathematics .....	5	0	5	DD 310 Descriptive Geometry .....	2	4	4
ENG 302 Communicative Skills: English	3	0	3	ENG 304 Communicative Skills: Speech ..	2	0	2
PHY 302 Physics: Work, Energy, Power	3	2	4	ELN 301 Industrial Controls .....	3	2	4
MECH 302 Materials, Tools, and Processes..	2	2	3	MECH 304 Metallurgy..	3	2	4
Totals .....	15	10	19	Totals .....	12	14	18

<i>Fifth Quarter</i>				<i>Sixth Quarter</i>			
DD 305 Design				DD 306 Design			
Drafting I .....	2	6	4	Drafting II .....	4	6	6
MECH 305 Strength				DD 312 Jig and			
of Materials .....	3	2	4	Fixture Design .....	2	4	4
PHY 305 Hydraulics				SOC 302 Economics ....	3	0	3
and Pneumatics .....	2	4	4	ISc 301 Industrial			
DD 311 Mechanisms ....	3	2	4	Organization and			
				Management .....	3	0	3
				SOC 301 Human			
				Relations .....	2	0	2
Totals .....	10	14	16	Totals .....	14	10	18

## DRAFTING AND DESIGN TECHNOLOGY

### Course Descriptions

#### DD 301 TECHNICAL DRAFTING

The field of drafting and design is introduced as the student begins study in drafting practices and principles. Basic skills and techniques of drafting included are: use of drafting equipment, lettering, freehand orthographic and pictorial sketching, geometric construction, orthographic instrument drawing of principal views, and standards and practices of dimensioning and noting recommended by the American Standards Association. Methods of reproducing, filing, and storing of drawings are studied and the student is introduced to the "working drawing."

#### MECH 301 MATERIALS, TOOLS, AND PROCESSES

An overall view of the methods and procedures used to transform the raw material into a finished product. Characteristics of metals, woods, and plastics and how these characteristics affect the selection and use of materials and methods of production in the manufacture of an object. Unit production system, sand casting, forging and allied processes, welding, sheet metal working processes, and woodworking processes constitute areas of study.

#### DD 302 TECHNICAL DRAFTING

The application of orthographic projection principles to the more complex drafting problems, primary and secondary auxiliary views, simple and successive revolutions, and sections and conventions will be studied. Most important is the introduction of the graphical analysis of space problems. Problems of practical design elements involving points, lines, planes, and a combination of these elements shall be studied. Dimensioning practices, approved by the American Standards Association, in precision and limit dimensioning will also be included.

#### MECH 302 MATERIALS, TOOLS, AND PROCESSES

Continuation in the study of methods of manufacturing of objects. Confined principally to the machining of materials. The operation of lathes, grinders, drills, milling machines, shapers, planers, metal sawing machines, broaching machines, gear cutting machines, and finishing machines. Dimensional control and precision measuring are an important part of this study.

#### DD 303 TECHNICAL DRAFTING

Intersections and developments and their practical solutions will be studied and, where applicable, model solutions shall accompany the problems. The various types and methods employed to produce isometric and oblique drawings, isometric, dimetric, and trimetric projections, and rendered pictorials will be included.



## **MECH 303 MATERIALS, TOOLS, AND PROCESSES**

Mass-production system is discussed and various methods of production by the processes studied in previous courses are explored. Production in areas of casting, forging, molding, presswork, drilling, boring, reaming, turning, grinding, milling, and surface finishing are studied and design considerations in these areas are determined.

## **DD 304 TECHNICAL DRAFTING**

Applications and constructions of charts, graphs, and nomographs will be studied as to their relationship to engineering and technical data. Screw threads, springs, keys, rivets, piping, and welding symbols, methods of representing and specifying will be covered. Basic mechanisms of motion transfer, gears and cams, will be studied and drawn with emphasis on methods of specifying, calculating dimensions, and delineating.

## **DD 310 DESCRIPTIVE GEOMETRY**

This is a study of the graphical analysis of space problems. The problems deal with practical design elements involving points, lines, planes, connectors, and a combination of these. Also included are problems dealing with solid geometry theorems. Where applicable, each graphical solution shall be accompanied by the analytical solution and visualization shall be stressed on every problem.

## **DD 305 DESIGN DRAFTING I**

Basic design is introduced in the study of motion transfer mechanisms as they relate to power trains. Principles of design sketching, design drawing, layout drafting, detailing from layouts, production drawings, and simplified drafting practices constitute areas of study. Types and methods of specifying materials and workmanship are an integral part of the course.

## **MECH 305 STRENGTH OF MATERIALS**

A study of the stresses and strains that occur in materials when subjected to tensile, compressive, and/or shearing forces. Stresses in thin-walled cylinders, riveted and welded joints, shear and bending moment diagrams, deflection, eccentrically applied loads, torsion, and factors of column design.

## **PHY 305 HYDRAULICS AND PNEUMATICS**

The basic theory of hydraulic and pneumatic systems and their combinations in various circuits. Function and basic design of circuits and motors, controls, electrohydraulic servo elements, plumbing, filtration, accumulators and reservoirs, constitute major areas of study.

## **DD 311 MECHANISMS**

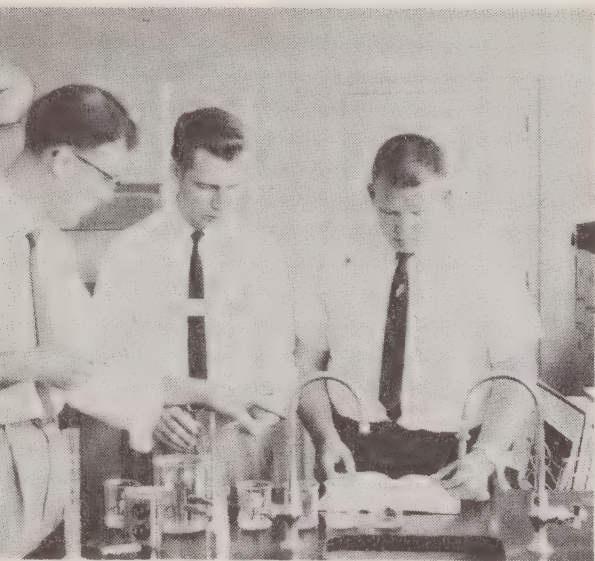
This course consists of mathematical and drafting room solutions of problems involving the principal machine elements. Included is a study of motions of linkage, velocities and acceleration of points within a link mechanism, and layout methods for designing cams, belting, pulleys, gears, and gear trains.

## **DD 306 DESIGN DRAFTING II**

Research to solve a problem in design by consulting various manuals, periodicals, and through laboratory experiments. A written technical report, preliminary design sketches, layout drawings, detail drawings, assembly and sub-assembly drawings, pictorial drawings, exploded pictorial assembly, patent drawings, and specifications are required as a part of the problem.

## **DD 312 JIG AND FIXTURE DESIGN**

Designed to give the student a thorough knowledge of the principles, practices, tools, and commercial standards of jig and fixture design. Through lectures, visual aids, and individual project and design work, the student becomes well acquainted with the many types of jig and fixtures and their design.



## CHEMICAL TECHNOLOGY

The chemical technology student studies the fundamentals of general chemistry and organic chemistry and learns how to perform qualitative, and analytical analyses. The student will study substance and the reactions between them and learns the methods and procedures used in the discovery and development of new products. In the unit operation laboratory the student will learn material handling; crushing, grinding, and sizing; he studies chemical machinery and methods used in extraction, distillation, evaporation, drying, absorption, and heat transfer. He also devises, installs, and operates chemical manufacturing processes.

## OCCUPATIONAL OPPORTUNITIES

The chemical technology graduate will find employment in a wide variety of fields such as foods, metals, paints, glass, plastics, rubber, fuels, paper, building products, dyes, oils, lubricants, and heavy chemicals.

This individual will fill such jobs as Research Assistant, Control Chemist, Laboratory Technician, Chemical Analyst, and Pilot Plant Foreman.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>
<i>First Quarter</i>				<i>PHY 303 Physics:</i>			
CHEM 310 General				Electricity	3	2	4
Chemistry	3	6	6	Totals	14	8	18
MA 301 Technical							
Mathematics	5	0	5	<i>Fourth Quarter</i>			
ENG 301 Communicative				CHEM 313 Quantitative			
Skills: Reading				Chemical Analysis	2	10	7
Improvement	2	0	2	MA 304 Technical			
PHY 301 Physics:				Mathematics	3	0	3
Properties of Matter	3	2	4	ISc 301 Industrial			
Totals	13	8	17	Organization and			
<i>Second Quarter</i>				Management	3	0	3
CHEM 311 General				CHEM 314 Physical			
Chemistry	3	6	6	Chemistry	3	2	4
MA 302 Technical				Totals	11	12	17
Mathematics	5	0	5	<i>Fifth Quarter</i>			
ENG 302 Communicative				CHEM 315 Organic			
Skills: English	3	0	3	Chemistry	3	6	6
PHY 302 Physics: Work,				SOC 302 Economics	3	0	3
Energy, Power	3	2	4	CHEM 317 Industrial			
Totals	14	8	18	Chemical Analysis	3	10	8
<i>Third Quarter</i>				Totals	9	16	17
CHEM 312 Quantitative				<i>Sixth Quarter</i>			
Chemical Analysis	3	6	6	CHEM 316 Organic			
MA 303 Technical				Chemistry	2	6	5
Mathematics	5	0	5	CHEM 318 Industrial			
ENG 303 Communicative				Chemical Analysis	5	10	10
Skills: Technical				Totals	7	16	15
Writing	3	0	3				



# CHEMICAL TECHNOLOGY

## Course Descriptions

### CH 310 GENERAL CHEMISTRY

An introductory course serving as a base for future development in the chemical areas. Chemical terms, systems of measurement, atomic structure, states of matter, and the properties of elements, compounds, and mixtures constitute major fields of study. Laboratory work consists of various inorganic reactions and preparations.

### CH 311 GENERAL CHEMISTRY

A study of the properties of gases, types of chemical reactions, equivalent weights, combining properties of the elements, functions of the periodic table, and properties of electrolytes and nonelectrolytes. Classroom theory is supported by extensive laboratory work, preparing and studying the behavior of gases, types of chemical reactions, and properties of solutions.

### CH 312 QUANTITATIVE ANALYSIS

Emphasis is placed on developing laboratory techniques employed in the volumetric analysis of acids and bases. The students will become thoroughly familiar with the principles and procedures of neutralization titration. Classroom work will emphasize the stoichiometric calculations involved in interpreting the results of analysis. Laboratory work will consist of percentage analysis of selected substances.

### CH 313 QUANTITATIVE ANALYSIS

This quarter is devoted to the more complex types of volumetric analysis. Special emphasis is placed on the theory of oxidation reduction and gravimetric analysis. The student will become familiar with the principles of redox reactions, ionization constants, and PH of solutions. Stress is placed on the stoichiometric calculations of analysis. Classroom work is supported with quantitative determinations in the laboratory.

### CH 314 PHYSICAL CHEMISTRY

Atomic theory, states of matter, chemical thermodynamics, molecular properties solutions, equilibria, phase rule, electro-chemistry, kinetics, surface chemistry, and photochemistry constitute major areas of study. Experiments, selected by the instructor, serve as a basis for laboratory work.

### CH 315 ORGANIC CHEMISTRY

The nomenclature, structure, preparation, properties, and reactions of aliphatic organic compounds constitute major areas of study. Laboratory work emphasizes techniques, and selected preparations.

### CH 317 INDUSTRIAL CHEMISTRY

A course designed to incorporate the chemical needs of industry in the area adjacent to a particular center so that the principles and techniques learned in previous quarters can be applied by the student to practical problems. An actual plant production situation is simulated and a solution effected based on the student's background of chemical knowledge. It will be the responsibility of the instructor to determine and submit in outline form a program of suitable scope and sequence of topics which

he will work out from consultation with his local advisory committee, representing the industry. This program must be approved by the center director and accepted by the appropriate state level authority.

#### CH 316 ORGANIC CHEMISTRY

The nomenclature, structure, preparation, properties, and reactions of aromatic organic compounds. Laboratory work emphasizes techniques; invalues preparation and analyses of selected organic compounds.

#### CH 318 INDUSTRIAL CHEMISTRY

A continuation of Industrial Chemistry I. A simulated plant situation is maintained and the chemical background of the student is utilized fully. Problems of plant layout and design, organization and management, and percentage yield are considered. The student will draw from his experiences in the related areas of mathematics, industrial organization and management, and technical report writing in maintaining complete and accurate records of all phases of the operation. When feasible some related work should be done in the Mechanical and Drafting and Design areas, giving the student an understanding of the problems encountered in these specialty fields.



# School of Industrial Technology

The following areas of study are included in the school of Industrial Technology.

Mechanical Technology

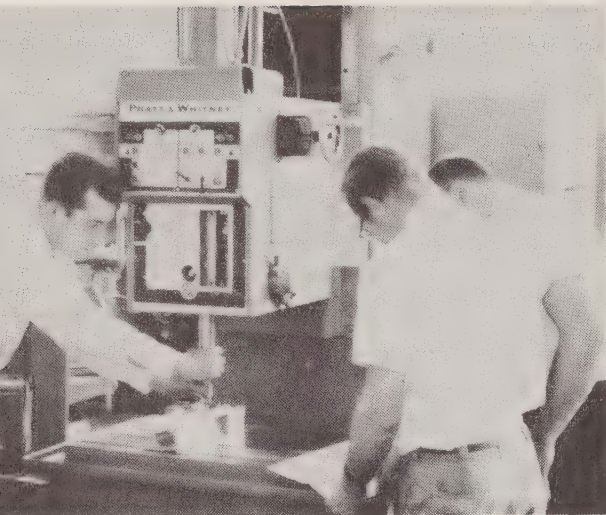
Instrumentation Technology

Distribution and Marketing

All of the areas of study in the School of Industrial Technology are two years in duration and will require about twenty-five to thirty hours per week of study. If a student elects to enroll in the school of Industrial Technology through extension because of his work load, the time required for completion will be doubled. The extension division will offer fifteen hours per week in a particular area of study.

In addition to the regular classroom work each student will be required to spend additional time on outside assignments. The school of industrial technology will require each student to demonstrate an ability to follow an actual production situation from raw material to finished product.

Certain courses are required of every student irrespective of the curriculum area. These courses are core courses and will serve as related areas of study in addition to the subjects required by the curriculum major.



## MECHANICAL TECHNOLOGY

The mechanical technology student will learn the principles of machine design and their applications. He studies torsion, bending, and flexure, of metals; industrial machinery, clutches, brakes, springs, and flywheels. He designs linkage, gear trains, and cams to give required motion to machine. The student will make accurate and complete engineering drawings of the parts that have been designed so that these parts can be produced in the shop. A complete study of materials and processes will be conducted by each student.

## OCCUPATIONAL OPPORTUNITIES

Sales Engineers, Research Assistants, Layout and Detail Draftsman, Foreman, Machine Designers, Assistant Plant Engineers, Field Service Engineers, Plant Safety Technician, and Mechanical Test Technician.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>
<i>First Quarter</i>				<i>Third Quarter</i>			
DD 307 General				MA 303 Technical			
Drafting .....	2	3	3	Mathematics .....	5	0	5
MA 301 Technical				PHY 303 Physics:			
Mathematics .....	5	0	5	Electricity .....	3	2	4
ENG 302 Communica-				ENG 303 Communica-			
tive Skills: English ..	3	0	3	tive Skills: Technical			
PHY 301 Physics:				Writing .....	3	0	3
Properties of Matter	3	2	4	MECH 308 Machine			
MECH 306 Machine				Processes .....	2	4	4
Processes .....	2	4	4	CHEM 301 General			
ENG 301 Communica-				Chemistry .....	3	2	4
tive Skills: Reading							
Improvement .....	2	0	2				
Totals .....	17	9	21	Totals .....	16	8	20
<i>Second Quarter</i>				<i>Fourth Quarter</i>			
DD 308 General				MECH 309 Machine			
Drafting .....	2	3	3	Processes .....	2	4	4
MA 302 Technical				MECH 310 Physical			
Mathematics .....	5	0	5	Metallurgy .....	3	2	4
ENG 304 Communica-				ELEC 301 Electrical			
tive Skills: Speech ..	2	0	2	Machinery .....	3	0	3
PHY 302 Physics:				MECH 312 Practical			
Work, Energy, Power	3	2	4	Automation .....	3	2	4
MECH 307 Machine				PHY 306 Applied			
Processes .....	2	4	4	Mechanics .....	5	0	5
SOC 301 Human							
Relations .....	2	0	2				
Totals .....	16	9	20	Totals .....	16	8	20



<i>Fifth Quarter</i>				<i>Sixth Quarter</i>			
MECH 311 Physical Metallurgy .....	3	2	4	ISc 301 Industrial Organization and Management .....	3	0	3
PHY 305 Hydraulics and Pneumatics .....	2	4	4	DD 312 Jig and Fixture Design .....	2	4	4
DD 311 Mechanisms ....	3	2	4	DD 309 Plant Layout ..	3	2	4
MECH 305 Strength of Materials .....	3	2	4	MECH 313 Production Planning .....	3	0	3
ISc 302 Quality Control	3	2	4	ISc 303 Motion Study ....	3	2	5
				SOC 302 Economics ....	3	0	3
	—	—	—		—	—	—
Totals .....	14	12	20	Totals .....	17	8	21
<i>Electives</i>							
MECH 314 Tool Eng.....	3	0	3				
ISc 304 Value Analysis .....	2	2	3				
PHY 307 Control Systems .....	2	4	4				

## MECHANICAL TECHNOLOGY

### Course Descriptions

#### MECH 306 MACHINE PROCESSES

An introductory course designed to acquaint the student with basic hand tools, safety procedures, and machine processes of our modern industry. It will include a study of measuring instruments, characteristics of metals, and cutting tools. The student will become familiar with the lathe family of machine tools by performing selected operations such as turning, facing, threading, drilling, boring, and reaming.

#### MECH 307 MACHINE PROCESSES

A continuation of experience begun in MECH 306 with advanced operations on the lathe, drilling, boring, and reaming machines. The student will become acquainted with the milling machine in theory and practice.

#### MECH 308 MACHINE PROCESSES

A continuation in the familiarization of the modern machine tools of industry. Through theory practice and demonstration, the student concerns himself with the shaper, slotter, planer, turret lathe, screw machine, grinding and finishing machines. Gear design and the processes of manufacturing will be analyzed throughout the course.

#### MECH 309 MACHINE PROCESSES

A study dealing with the newer concepts of work handling and automatic machining processes. A large portion of the theory units will cover topics such as methods of chipless production and new techniques in metal forming. An analysis of high energy forming, ultrasonic machining, electrolytic metal removal, chemical milling, numerical controls, and simplified building block numerical control systems.

## MECH 311 PHYSICAL METALLURGY

A continuation of Physical Metallurgy I expanding on the properties of metals and alloys, the reaction of metals, diffusion, carburizing, metal bonding, and homogenization. Other topics covered will be recrystallization and grain growth, age hardening, nitriding, internal-oxidation and heat treatment of steel. Laboratory experiments and demonstrations will be utilized throughout the course.

## DD 311 MECHANISMS

This course consists of mathematical and drafting room solutions of problems involving the principal machine elements. Included is a study of motions of linkages, velocities and acceleration of points within a link mechanism, and layout methods for designing cams, belting, pulleys, gears and gear trains.

## DD 312 JIG AND FIXTURE DESIGN

Designed to give the student a thorough knowledge of the principles, practices, tools, and commercial standards of Jig and Fixture Design. Through lectures, visual aids, and individual project and design work, the student becomes well acquainted with the many types of jigs and fixtures and their design.

## MECH 313 PRODUCTION PLANNING

A study of day-to-day plant direction is subdivided for analysis into forecasting, product planning and control, scheduling, dispatching, routing, and inventory control. Case histories are discussed in the classroom for clinical analysis and courses of corrective action are developed.

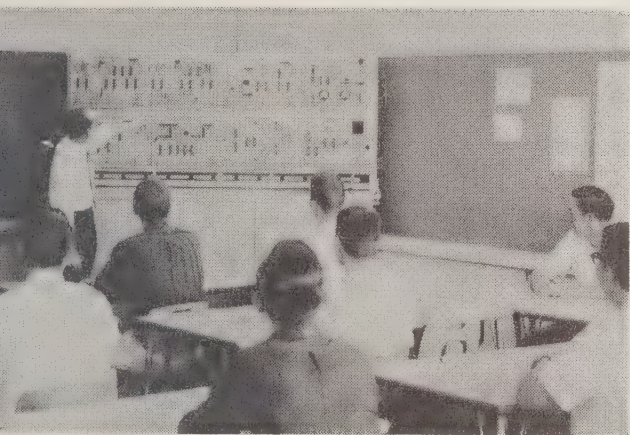
## ISC 304 VALUE ANALYSIS

The modern concept in the control of manufacturing production. This course will provide the student an opportunity to study a production system with the specific purpose of identifying unnecessary costs.

## PHY 307 CONTROL SYSTEMS

Hydraulic, pneumatic, mechanical, electrical and electronic control systems and components. Basic descriptions, analysis and explanation of operations.





## INDUSTRIAL INSTRUMENTATION TECHNOLOGY

Industrial instruments and automatic control systems are rapidly becoming the nerve centers of our nation's modern industrial plants. This course is designed to develop instrument technicians who are qualified to solve problems involving basic design, installation, and maintenance of complicated instruments and automatic control systems.

## OCCUPATIONAL OPPORTUNITIES

Occupational opportunities are found in industry as Maintenance Technicians, Research Technicians, Instrument Shop Foreman or Supervisors, and Technical Sales Representatives.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Credit</i>
<i>First Quarter</i>				<i>Third Quarter</i>			
DD 307 General Drafting .....	1	4	3	MA 303 Technical Mathematics .....	5	0	5
MA 301 Technical Mathematics .....	5	0	5	ENG 303 Communicative Skills .....	2	0	2
ENG 301 Reading Improvement .....	2	0	2	CHEM 301 General Chemistry .....	4	2	5
Phy 301 Physics .....	3	2	4	INS 305 A.C. Theory ..	2	2	3
INS 301 Pressure and Flow Measuring Devices .....	5	3	7	INS 306 Automatic Control Instruments ....	2	3	4
INS 302 Mechanics and Heat .....	1	2	2	Totals .....	15	7	19
Totals .....	17	11	23				
<i>Second Quarter</i>				<i>Fourth Quarter</i>			
DD 308 General Drafting .....	1	4	3	MA 304 Technical Mathematics .....	5	0	5
MA 302 Technical Mathematics .....	5	0	5	SOC 302 Economics ....	4	0	4
ENG 302 Communicative Skills .....	2	0	2	ENG 304 Communicative Skills .....	3	0	3
Phy 302 Physics .....	3	2	4	INS 307 Automatic Control Systems I .....	2	3	4
SOC 301 Human Relations .....	2	0	2	ISc 302 Quality Control	3	2	4
INS 303 Special Measurements .....	2	2	3	Totals .....	18	5	20
INS 304 D.C. Theory ..	2	2	3				
Totals .....	17	10	22				

<i>Fifth Quarter</i>			<i>Sixth Quarter</i>		
ISC 301 Industrial Org. and Mgt. ....	3	0	3	MECH 302 Materials, Tools, and Processes	4 0 4
ISc 303 Motion Study	4	2	5	DD 309 Plant Layout ..	3 2 4
DD 311 Mechanisms ....	4	2	5	INS 310 Automatic Con- trol Systems III .....	2 3 4
INS 308 Automatic Con- trol Systems II .....	2	3	4	INS 311 Analytical Instruments .....	3 3 5
INS 309 Electronics ....	2	3	4	INS 312 Process Control Problems and Design	3 3 5
<hr/>			<hr/>		
Totals .....	15	10	21	Totals .....	15 11 22

## INDUSTRIAL INSTRUMENTATION TECHNOLOGY

### Course Descriptions

#### INS 301 PRESSURE AND FLOW MEASURING DEVICES

This is a study of the elementary applications and theory of pressure measurement instruments. Also included will be a study of the principles, operation, and calibration of transmitters, receivers, recorders, and indicators as they relate to flow theory, meters, and applications, area-meters, displacement meters and manifold systems.

#### INS 302 MECHANICS AND HEAT

This course is designed with an approach to mechanics and heat. The physics of heat will be emphasized to give the student an understanding of the problems that heat can cause in systems in industry. The mechanics phase will emphasize mechanical advantages that can be introduced in particular industrial situations. This course is basic to other courses that will be in the advanced work.

#### INS 303 SPECIAL MEASUREMENTS

Special measurements will be given consideration in the first part of the curriculum in order for the student to utilize his knowledge of these measurements throughout the entire curriculum. This course will include industrial weighers, tachometers, governors, air velocity, meters, and accelerometers. Also included in this course is a study of density, psychrometer hygrometer, and dew point measurement. The course will end with a study of viscosity, consistency, moisture, and photometric measurements.

#### INS 304 D. C. THEORY

This is a basic direct current electricity course for instrument students. An intensive study in electron flow, Ohm's Law, Kirchoff's Law, circuits, measurements, magnets, magnetism, resistors, capacitors, and inductance will be included.



### INS 305 A. C. THEORY

This course is a basic study in alternating current theory and applications. Sine waves and concept of frequency, transformers, polyphase systems, reactance, impedance, measurements, filters, amplifiers, servomotors, and oscillators will be included in the course.

### INS 306 AUTOMATIC CONTROL INSTRUMENTS

This is a study of the automatic control instruments. The course will include principles, operations, and construction of pneumatic, hydraulic, electric, timers, and program and automatic ratio controllers. Also included will be theory of feedback; position detectors, reset and rate-action controllers.

### INS 307 AUTOMATIC CONTROL INSTRUMENTS

This is a study of automatic control theory, elementary processes, and problems. Concepts of feedback, algebraic equations of feedback systems, and concept of the process in the feedback loop. Laboratory construction of control circuits will be included.

### INS 308 AUTOMATIC CONTROL SYSTEMS II

This is a continuation of Automatic Control Systems I with advanced study in theory, process control systems, and problems. This course will also go into final control elements, operations, process characteristics, time lag, dead tune, and control processes as a servo-system.

### INS 309 ELECTRONICS

This course will include basic electronic theory as it relates to control processes. A basic study of servomechanisms as related to closed loop control systems, electromechanical, and hydroelectrical devices is included. Application characteristics are stressed.

### INS 310 AUTOMATIC CONTROL SYSTEMS III

This is a continuation of Automatic Control Systems I and II with emphasis placed on more complicated combination control circuits. Controller requirements, cascade control systems, and factors in the selection of controllable process variables will be included.

### INS 311 ANALYTICAL INSTRUMENTS

This is a study of analytical instruments and their applications in the various process systems. Operating principles of PH infra-red and other analytical techniques most frequently used in industrial process equipment will be included.

### INS 312 PROCESS CONTROL PROBLEMS AND DESIGN

This is a problem course in the planning and drawing of specifications for a process control system. Instrument selection, installation planning, and system operation will be emphasized.

# DISTRIBUTION AND MARKETING TECHNOLOGY

## PURPOSE OF CURRICULUM:

Since 1957 more than half of all employed persons in the United States have been engaged in the distribution and service occupations. As the population of North Carolina becomes more urban, and much more differentiating in its demand for goods and service, opportunities in business become increasingly attractive. Industrial development is rapidly expanding throughout the state, business is much more highly organized, and increasingly competitive. These factors, plus the impact of automation, limits the more desirable opportunities in the distribution and marketing occupations to those with specialized education beyond the high school level.



## EMPLOYMENT OPPORTUNITIES

It is anticipated that graduates of this program will enter the distribution and marketing field in a variety of career opportunities. After some experience, those persons exhibiting initiative and creativity should have ample opportunity to advance to mid-management and management positions within the following occupational areas:

Advertising

Credit

Retailing

Banking

Finance

Tourist and  
Travel

Communications

Insurance

Wholesale

Course Title	Class	Lab	Credit	Course Title	Class	Lab	Credit
<i>First Quarter</i>				<i>Second Quarter</i>			
ENG 301 Communicative Skills: Reading Improvement .....	2	0	2	BUS 305 Business Speech .....	3	2	4
ENG 302 Communicative Skills: English .....	3	0	3	SOC 303 Introduction to Psychology .....	3	0	3
BUS 312 Marketing .....	3	0	3	BUS 317 Sales Development .....	3	2	4
BUS 311 Business Mathematics .....	3	0	3	BUS 320 Accounting .....	5	2	6
SOC 302 Economics .....	3	0	3	BUS 314 Occupational Analysis .....	1	4	3
BUS 313 Occupational Orientation .....	1	4	3				
Totals .....	15	4	17	Totals .....	15	10	20



<i>Course Title</i>	<i>Class Lab Credit</i>			<i>Course Title</i>	<i>Class Lab Credit</i>		
<i>Third Quarter</i>				<i>Fifth Quarter</i>			
BUS 310 Written Sales Communications ----- 3 2 4				BUS 332 Sales Promotion Management ----- 3 2 4			
BUS 316 Retailing ----- 3 0 3				BUS 333 Personnel Management ----- 3 0 3			
BUS 321 Accounting ----- 5 2 6				BUS 334 Transportation 3 0 3			
BUS 319 Credit Procedures and Problems ----- 3 0 3				BUS 318 Business Law_ 5 0 5			
BUS 315 Occupational Research ----- 1 4 3				BUS 330 Marketing Research ----- 1 4 3			
Totals ----- 15 8 19				Elective * ----- 3 0 3			
<i>Summer Session</i>				Totals ----- 18 6 21			
BUS 338 Work Experience and Project							
231 MINIMUM HOURS 7							
<i>Fourth Quarter</i>				<i>Sixth Quarter</i>			
BUS 326 Business Organization and Operation ----- 3 0 3				BUS 335 Business Management ----- 3 0 3			
BUS 327 Advertising --- 3 2 4				BUS 336 Economics of Distribution ----- 3 0 3			
BUS 328 Business Insurance ----- 3 0 3				BUS 337 Wholesaling --- 3 0 3			
BUS 322 Accounting ----- 5 2 6				BUS 331 Marketing Research ----- 1 4 3			
BUS 329 Marketing Research ----- 1 4 3				Elective * ----- 6 0 6			
Totals ----- 15 8 19				Totals ----- 16 4 18			

\* Elective subjects must be related to the student's career objective and may be selected from courses offered by the Technical Institute or Industrial Education Center. Elective subjects include merchandising, warehousing, banking, and typing.

## BUS 312 MARKETING

A study of the marketing structure within the framework of the U. S. economic system. It includes the study of the movement of goods from producer to consumer through various channels of distribution, the functions of marketing, and the social and economic implications. Prerequisite: None.

## BUS 311 BUSINESS MATHEMATICS

This course stresses the fundamental operations and their application to business problems. Topics covered include payrolls, price marking, interest and discount, commission, insurance, taxes and other pertinent uses of mathematics in the field of business. Prerequisite: None.

## BUS 313 OCCUPATIONAL ORIENTATION

Orients the student to the business world through basic research of business practices including a study of how and why certain company policies, rules and regulations are established. The student learns how to study and utilize library facilities in preparing various reports and analyses on such topics as: business etiquette, how to apply for a job, employee-employer relations. Prerequisite: None.

## **BUS 305 BUSINESS SPEECH**

Develops the ability to speak correctly, persuasively and with confidence in sales situations, training session, business conferences—small and large. Prerequisite: ENG 302.

## **SOC 303 INTRODUCTION TO PSYCHOLOGY**

Designed to provide an understanding of the basic psychological concepts of human behavior. The phenomenal aspects of the individual's behavior as he strives to adapt to his social and economic environment will be explored. Prerequisite: None.

## **BUS 317 SALES DEVELOPMENT**

A study of retail, wholesale and specialty selling. Emphasis is placed upon mastering and applying the fundamentals of selling. Preparation for and execution of sales demonstrations required. Prerequisite: None.

## **BUS 320 ACCOUNTING**

Principles, techniques and tools of accounting, for understanding of the mechanics of accounting — collecting, summarizing, analyzing, and reporting information about service and mercantile enterprises, to include practical application of the principles learned. Prerequisite: None.

## **BUS 314 OCCUPATIONAL ANALYSIS**

Provision for research centers around the study of functions performed in selected jobs in distribution. Students learn methods of job analysis and application of job analysis techniques. Self analysis of and by each student is made. Ultimate objective is to help the student determine his career objective. Prerequisite: BUS 313.

## **BUSINESS 310 WRITTEN SALES COMMUNICATIONS**

Develops skills and techniques in writing business communications. Emphasis is placed on writing action—getting sales letters and prospectuses. Business reports, summaries of business conferences, spot announcements for radio and television as well as letters involving credit, collections, adjustments, complaints, orders, acknowledgments, remittances, and inquiry are also included in this course. Prerequisite: ENG 302.

## **BUS 316 RETAILING**

A study of the role of retailing in the economy including development of present retail structure, functions performed, principles governing effective operation and managerial problems resulting from current economic and social trends. Prerequisite: None.

## **BUS 321 ACCOUNTING**

Partnership and corporation accounting including a study of payrolls, Federal and State taxes. Emphasis is placed on the recording, summarizing and interpreting data for management control rather than on book-keeping skills. Accounting services are shown as they contribute to the recognition and solution of management problems. Prerequisite: BUS 320.



## **BUS 319 CREDIT PROCEDURES AND PROBLEMS**

Principles and practices in the extension of credit; collections procedures; laws pertaining to credit extension and collection are included. Prerequisite: None.

## **BUS 315 OCCUPATIONAL RESEARCH**

Selection and planning of a project related to the student's work experience as provided for in BUS 338—**Work Experience and Project**. Prerequisite: BUS 314.

## **SUMMER SESSION**

## **BUS 338 WORK EXPERIENCE AND PROJECT 231 MINIMUM HOURS**

A minimum of 231 clock hours of related on-the-job work experience during the summer between the first and second school year. The employing firm and the type of work experience must be approved by the school. As a part of this course, the student will conduct and make a written report on a project related to his job training employment. The project must be of a practical nature. The project and grade for this course will be determined jointly by the student's employer and the administration. Prerequisite: BUS 315.

## **BUS 326 BUSINESS ORGANIZATION AND OPERATION**

A study of the legal structures of the various types of business organizations, methods of financing, internal organization and management. Prerequisite: None.

## **BUS 327 ADVERTISING**

The role of advertising in a free economy and its place in the media of mass communications. A study of advertising appeals; product and market research; selection of media; means of testing effectiveness of advertising. Theory and practice of writing advertising copy for various media. Prerequisite: None.

## **BUS 328 BUSINESS INSURANCE**

A presentation of the basic principles of risk insurance and their application. A survey of the various types of insurance is included. Prerequisite: None.

## **BUS 322 ACCOUNTING**

Thorough working knowledge of concepts used in preparation and interpretation of financial statements. Each item of the income statement and balance sheet is carefully analyzed. Prerequisite: BUS 321.

## **BUS 329 MARKETING RESEARCH**

Acquaintance with sources of information and data pertaining to business and industry published by business, industry, governments and educational institutions. To teach the student how to interpret statistical charts and data. Prerequisite: None.

## BUS 332 SALES PROMOTION MANAGEMENT

The scope and activities of sales promotion with emphasis on the coordination of advertising, display, special events, and publicity. External and internal methods of promoting business; budgeting, planning, and implementing the plan. Prerequisite: BUS 327.

## BUS 333 PERSONNEL MANAGEMENT

Principles of human relationships; selection of personnel by interviewing and testing; and training of personnel. Prerequisite: None.

## BUS 334 TRANSPORTATION

Introduction to transportation media — their history and development. A practical consideration of the transportation problems in business. Prerequisite: None.

## BUS 318 BUSINESS LAW

Basic business laws, including the law of contracts, negotiable instruments, agency, partnership, corporation, deeds of conveyance, etc., will be covered. A primary objective of the course is to enable the student to know when to consult a professional lawyer. Prerequisite: None.

## BUS 330 MARKETING RESEARCH

Familiarization with market research studies, objectives, how they are planned, conducted, reported and interpreted. Prerequisite: BUS 329.

## BUS 335 BUSINESS MANAGEMENT

Principles of business management including overview of major functions of management such as planning, staffing, controlling, directing, and financing. Clarification of the decision-making function versus the operating function. Role of management in business — qualifications and requirements. Prerequisite: None.

## BUS 336 ECONOMICS OF DISTRIBUTION

How our business system operates. The free enterprise philosophy is developed, followed by study of production, value and price, business cycles and other economic theories. Prerequisite: SOC 302.

## BUS 337 WHOLESALING

The development of wholesaling; present day trends in the United States. A study of the functions of wholesaling. Prerequisite: None.

## BUS 331 MARKETING RESEARCH

The student receives experience in planning, conducting, reporting, and interpreting an elementary market research study. He may work on an individual basis or as a member of a group. Prerequisite: BUS 330.



## School of Trades

The following areas of study are included in the School of Trades.

Tool and Die Making

Machine Shop

Welding

Automotive Mechanics

Air Conditioning-Refrigeration and Sheet Metal

Radio and Television Servicing

Heavy Equipment Maintenance  
(with Farm Machinery option)

Carpentry and Cabinet Making

The School of Trades will offer a variety of courses on a 4 quarter basis. The areas of study reflect the employment opportunities in the Western part of North Carolina. These curriculums require one full year for completion, with the exception of Welding. Welding is a nine months course. If a student elects to enroll in the School of Trades through extension because of his work load, the time required for completion will be doubled. The extension division will offer fifteen hours per week in a particular area of study. The full time schedule will require thirty hours per week.

The student enrolled in the School of Trades will spend most of his time in the shop working under actual industrial conditions. The rest of the time will be in the classroom and laboratory in related subjects. The School of Trades will require each student to demonstrate an ability to do work in his particular trade. Emphasis will be placed on becoming proficient in the use of machines, instruments, and other equipment related to a particular area of work.

Certain courses will be required of every student irrespective of his curriculum. These courses will enhance the student's ability to become a total individual with a proper attitude toward his work. A thorough understanding of the American system of Economics as it relates to the free enterprise system and corporate structure will be required of every student.

# MACHINE SHOP



The two objectives of the machine shop course are to help men now in machine shops get a solid working knowledge of overall machine shop practice and to provide men not working in machine shops with a broad understanding of machine tools and shop practices. This course presents in a practical manner the details of such basic shop operations as bench work, layout, drilling, lathe work, milling, shaping, planing, broaching, and grinding. The course also covers the operating principles of machine tools, the use of measuring and testing instruments, and blueprint reading.

## OCCUPATIONAL OPPORTUNITIES

Occupational opportunities are found in metal working factories, federal government installations, machine shops, maintenance shops, utility companies, and a wide variety of mechanical and technical activities.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Shop</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Shop</i>	<i>Credit</i>
<i>First Quarter</i>					<i>Third Quarter</i>				
MECH 121 Machine Shop Theory and Practice	3	0	12	7	MECH 123 Machine Shop Theory and Practice	3	0	12	7
MA 120 Fundamentals of Mathematics	5	0	0	5	MECH 124 Structure of Metals	3	2	0	4
DD 122 Blueprint Reading	5	0	0	5	PHY 105 Applied Physics II	1	2	0	2
ENG 101 Reading Improvement	2	0	0	2	SOC 101 Human Relations	2	0	0	2
Totals	15	0	12	19	Totals	9	4	12	15
<i>Second Quarter</i>					<i>Fourth Quarter</i>				
MECH 122 Machine Shop Theory and Practice	3	0	12	7	MECH 125 Machine Shop Theory and Practice	3	0	12	7
MA 123 Machinist Mathematics	5	0	0	5	ISc 101 Industrial Specifications	2	0	0	2
DD 123 Blueprint Reading	3	0	0	3	MECH 111 Oxyacetylene Welding	2	0	3	3
PHY 104 Applied Physics I	1	2	0	2	MECH 126 Heat Treating Practice	0	0	3	1
ENG 102 Communication Skills	2	0	0	2	ISc 102 Industrial Organizations	3	0	0	3
Totals	14	2	12	19	Totals	10	0	18	16



# MACHINE SHOP

## Course Descriptions

### MECH 121 MACHINE SHOP THEORY AND PRACTICE

An introduction to the machinist trade and the potential it holds for the craftsman. Deals primarily with the identification, care, and use of basic hand tools and precision measuring instruments. Elementary layout procedures and processes on lathe, drill press, grinding (off-hand) and milling machines will be introduced both in theory and practice. Prerequisite: None.

### MECH 122 MACHINE SHOP THEORY AND PRACTICE

Advanced operations in layout tools and procedures, power sawing, drill press, surface grinder, milling machine, and shaper. The student will be introduced to the basic operations on the cylindrical grinder and will select a project encompassing all the operations, tools, and procedures thus far used and those to be stressed throughout the course. Prerequisite: MECH 121.

### MECH 123 MACHINE SHOP THEORY AND PRACTICE

Advanced work on the engine lathe, turning, boring and threading machines, grinders, milling machine, and shaper. Introduction to basic indexing and terminology with additional processes on calculating, cutting and measuring of spur, helical, and worm gears and wheels. The trainee will use precision tools and measuring instruments such as vernier height gages protractors, comparators, etc. Basic exercises will be given on the turret lathe and tool and cutter grinder. Prerequisites: MECH 121, 122.

### MECH 124 STRUCTURE OF METALS

Elementary and practical approach to metals, their structure, markings, classifications, and uses. Interpretation of properties and specifications of steels by use of manuals, catalogs, charts, etc. Prerequisite: None.

### MECH 125 MACHINE SHOP THEORY AND PRACTICE

Development of class projects using previously learned procedures in planning, blueprint reading, machine operations, final assembly, and inspection. Additional processes on the turret lathe, tool and cutter grinder, cylindrical and surface grinder, advanced milling machine operations, etc. Special procedures and operations, processes and equipment, observing safety procedures faithfully and establishing of good work habits and attitudes acceptable to the industry. Prerequisites: MECH 121, 122, 123.

### ISc 101 INDUSTRIAL SPECIFICATIONS

The "what" and "why" of specifications. Organizing and studying machine tool and hand tool specifications, job sheets, and procedure sheets. Catalogs, specification sheets, and manufacturer's handbooks serve as reference sources. Prerequisite: None.

### MECH 111 OXYACETYLENE WELDING

Basic welding procedures and practice. The trainee will gain experience in the gas welding of small parts and tools. This course will present gas welding as it may be used by the machinist in the repair and manufacture of tools and equipment. Prerequisite: None.

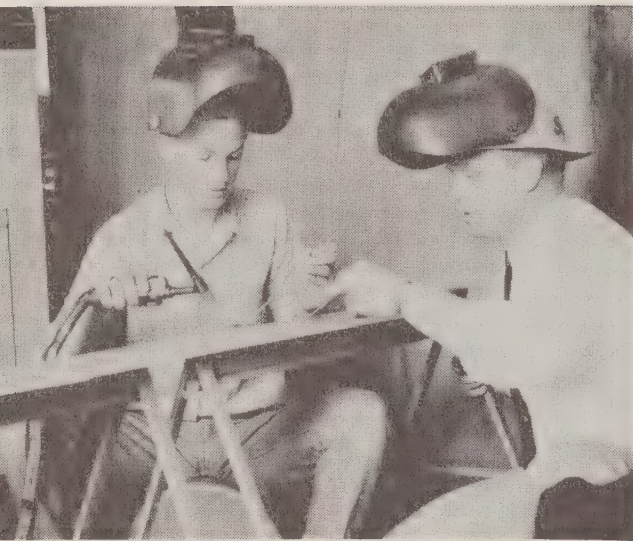
### MECH 126 HEAT TREATING PRACTICE

Working knowledge of methods of treating ferrous and nonferrous metals. The effects of hardening, tempering, and annealing upon the structure and physical properties of metals. Trainees will be given the opportunity to acquaint themselves with the equipment and processes needed in heat treating. Prerequisite: MECH 124.

## WELDING

The purpose of this course is to provide a sound training program of the skills involved in welding along with a background of technical information needed by the modern welder.

The curriculum is designed to give the student a sound foundation in the principles, practices, and usages of both gas and electric welding in modern industry. At the same time he will be given ample practice in the welding skills. In the shop theory and practice are combined under the guidance of an instructor thoroughly competent in the trade. In addition, instruction is given in the technical fields related to welding under the instruction of specialists in the technical fields.



## OCCUPATIONAL OPPORTUNITIES

Typical occupational opportunities are found in motor vehicle and equipment plants, air craft industry, construction companies, independent metal working repair shops, steel mills, and self-employment.

<i>First Quarter</i>	<i>Class</i>	<i>Lab.</i>	<i>Shop</i>	<i>Prac.</i>	<i>Credit</i>
MA 120 Fundamentals of Mathematics .....	5	0	0		5
MECH 124 Structure of Metals .....	3	2	0		4
WELD 110 Hand and Power Tools .....	0	0	3		1
DD 122 Blueprint Reading .....	5	0	0		5
WELD 120 Oxyacetylene Welding and Cutting .....	3	0	9		6
Total .....	16	2	12		21
<i>Second Quarter</i>					
ENG 101 Reading Improvement .....	2	0	0		2
MA 121 Geometry .....	3	0	0		3
DD 127 Blueprint Reading .....	3	0	0		3
ELEC 117 Basic Electricity .....	3	0	0		3
WELD 111 Arc Welding .....	3	0	12		7
Total .....	14	0	12		18
<i>Third Quarter</i>					
WELD 112 Mechanical Testing and Inspection .....	0	0	6		3
SOC 101 Human Relations .....	2	0	0		2
WELD 113 Inert Gas Welding .....	1	0	3		2
WELD 114 Introduction to Pipe Welding .....	3	0	12		7
SOC 105 Industrial Economics .....	3	0	0		3
Total .....	9	0	21		17



# WELDING

## Course Descriptions

### WELD 112 MECHANICAL TESTING AND INSPECTION

The standard methods for mechanical testing of welds. The student is introduced to the various types of tests and testing procedures and performs the details of the test which will give adequate information as to the quality of the weld. Types of tests to be covered are: bend, destructive, free-bend, guided-bend, nick-tear, notched-bend, tee-bend, nondestructive, V-notch, Charpy impact, etc.

Prerequisite: WELD III

### WELD 110 HAND AND POWER TOOLS

This course is designed to introduce the student to the correct use of hand tools found in the metals area. Also power tools used in work with metals are demonstrated. Each student will be required to do actual work requiring the use of hand and power tools.

### WELD 120 OXYACETYLENE WELDING, CUTTING THEORY AND PRACTICE

This will be an introduction to the history of oxyacetylene welding; the principles of welding and cutting; the equipment and how to assemble it; lighting and shutting off torch. Welding procedures, such as practice of puddling and carrying the puddle, running flat beads on thin gauge metals, butt welding in flat positions, vertical positions, and overhead positions. Also included will be flame cutting and fillet welding in different positions. There will be additional practice on heavy gauge metals using the different size torches.

### WELD 111 ARC WELDING THEORY AND PRACTICE

This course will be an introduction to arc-welding and will consist of history of arc-welding, principles of arc-welding, arc-welding equipment, safety and practice in the different positions, and various metal alloys.

### WELD 113 INERT GAS WELDING

This course will be an introduction to "Heliarc" welding and will consist of the study of equipment, safety practices, different uses of and advantages of this type of welding, and the general practice of inert gas welding.

### WELD 114 INTRODUCTION TO PIPE WELDING

Designed to provide practice in the welding of pressure piping in the horizontal, vertical and horizontal fixed positions using shielded metal arc welding processes.



## AUTOMOTIVE MECHANICS

This is a one-year program providing a thorough training in the theoretical as well as manual skills in servicing, testing, and diagnosing. All phases of the electrical system, the power plant, the power train, and the hydraulic braking system will be studied.

The courses are arranged in a sequence that gives the student the required technological and special courses as they are needed to coordinate his laboratory experiences.

Emphasis is placed on the mechanical parts and operation of the various automobile units. Trouble shooting and servicing of the live project is also stressed.

## OCCUPATIONAL OPPORTUNITIES

Auto Mechanic, Truck and Bus Mechanic, Shop Foreman, Maintenance Supervisor, Dealer Service Manager, Sales Technician, Factory Representative, and Experimental Lab Work are among those occupational opportunities awaiting graduates of the Automotive Mechanics Curriculum.

Course	Shop				Course	Shop			
	Class	Lab	Prac.	Credit		Class	Lab	Prac.	Credit
<i>First Quarter</i>					<i>Third Quarter</i>				
AUTO 121 Automotive Theory and Practice	3	0	12	7	AUTO 123 Automotive Theory and Practice	3	0	12	7
MATH 121 Mathematics	5	0	0	5	AHR 101 Automotive Air Conditioning	3	0	0	3
ENG 101 Reading Improvement	2	0	0	2	SOC 101 Human Relations	2	0	0	2
PHY 104 Applied Physics	1	2	0	2	MECH 112 Welding	0	0	3	1
	11	2	12	16	PHY 106 Applied Physics	1	2	0	2
<i>Second Quarter</i>						9	2	15	15
AUTO 122 Automotive Theory and Practice	3	0	12	7	<i>Fourth Quarter</i>				
PHY 105 Applied Physics	1	2	0	2	AUTO 124 Automotive Theory and Practice	3	0	9	6
ENG 102 Communication Skills	2	0	0	2	SOC 103 Management Procedures	3	0	0	3
DD 121 Blueprint Reading	3	0	0	3	AUTO 125 Automotive Testing and Service	3	0	9	6
	9	2	12	14		9	0	18	15



# AUTOMOTIVE MECHANICS

## Course Descriptions

### AUTO 121 AUTOMOTIVE THEORY AND PRACTICE—ENGINES

Designed to give the student a thorough knowledge in the use, maintenance, and storage of the various hand tools and measuring devices needed in automotive work. A study of the construction and operation of components of automotive engines. The student will learn testing of engine performance; servicing and maintenance for pistons, valves, cams and camshafts, fuel and exhaust systems, cooling systems; proper lubrication; and methods of testing, diagnosing and repairing of failure and defects in the various engine mechanisms. Prerequisite: None.

### AUTO 122 AUTOMOTIVE THEORY AND PRACTICE—ELECTRICAL AND FUEL SYSTEMS

A thorough study of the electrical and fuel systems of the automobile, the electrical system and its components; battery cranking mechanism, generator, ignition, accessories, and wiring. Intensive training in the components and operation of various types of automotive fuel systems. Characteristics of fuels and types of fuel systems for which they are best adapted. The special tools, circuits, and testing equipment for the fuel and electrical system are studied. Prerequisite: AUTO 121.

### AUTO 123 AUTOMOTIVE THEORY AND PRACTICE—CHASSIS AND SUSPENSIONS

Principles and functions of the components of automotive chassis. Practical job instruction in adjusting and repairing of the suspension, steering and braking systems. Units to be studied will be shock absorbers, springs, steering systems, steering linkage, front end adjustments, types and servicing of brakes, etc. Prerequisites: AUTO 121, 122.

### AHR 101 AUTOMOTIVE AIR CONDITIONING

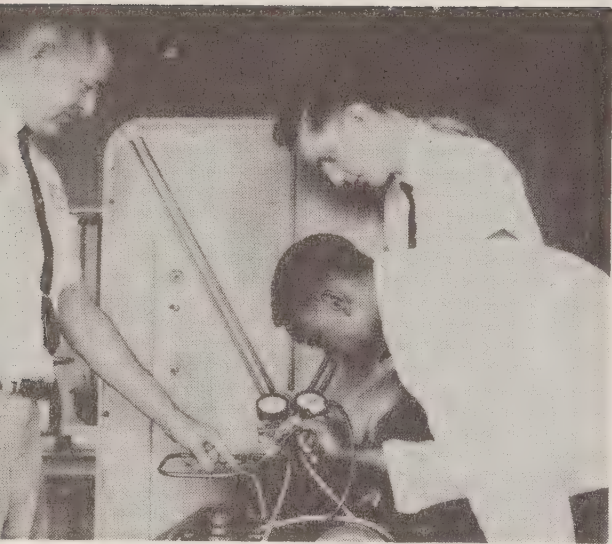
General introduction to the principles of refrigeration; study of the assembly of the components and connections necessary in the mechanisms, the methods of operation, and control; proper handling of refrigerants in charging the system. Prerequisites: PHY 105, PHY 106.

### AUTO 124 AUTOMOTIVE THEORY AND PRACTICE—POWER TRAIN

Detailed analysis of the components of the automotive power train system, with the emphasis on identification of troubles which develop in these components and the correct servicing and repair. Included are: types of clutches, clutch operation, inspection and servicing clutches; functions of the transmission gears, principles and operation of the various transmission and torque converter types, service and repair; operation, diagnosis and servicing for drive shaft assemblies, rear axles, and differentials. Prerequisites: PHY 105, PHY 106, AUTO 104.

### AUTO 125 AUTOMOTIVE TESTING AND SERVICE

Emphasis is on the shop procedures necessary in determining the nature of troubles developed in the various component systems of the automobile. Extensive use of testing equipment will be made on the actual problem situations. A close simulation to an actual automotive shop will be maintained and every effort will be made to give the student a full range of testing and servicing experience. Prerequisites: AUTO 121, 122, 123, 124.



## AIR CONDITIONING AND REFRIGERATION

The purpose of this curriculum is to provide a broad background of the technical information and skills necessary to the technician in designing, installing, and maintaining refrigeration and conditioning systems.

The curriculum is designed to provide the student with good foundation in the theory and principles of refrigeration and comfort conditioning and at the same time, to give him a chance to experiment and receive practice in installing, maintaining, and repairing refrigeration and conditioning mechanisms and their controls. In the portion of the time devoted to the laboratory, theory and practice are correlated under the laboratory instructor. In addition, instruction is given in the technical fields related to this field.

### OCCUPATIONAL OPPORTUNITIES

Occupational opportunities open to the graduate of this course of study are found most often in the areas of installation, service, inspection, sales, and in the growing fields of truck and trailer refrigeration and automobile air conditioning.

Course Title	Class	Lab	Shop	Credit	Course Title	Class	Lab	Shop	Credit
<i>First Quarter</i>					<i>Third Quarter</i>				
AHR 121 Elements of Refrigeration ....	5	0	6	7	AHR 123 A. C. and Refrigeration ....	5	0	6	8
ELEC 117 Basic Electricity .....	3	0	0	3	AHR 126 All Year Comfort Systems	3	0	4	5
DD 122 Blueprint Reading .....	5	0	0	5	AHR 128 Automatic Controls .....	2	0	2	3
MA 124 Algebra ..	5	0	0	5	SOC 104 Sales and Communications	2	0	0	2
MECH 112 Welding .....	0	0	3	1					
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	18	0	9	21		12	0	12	18
<i>Second Quarter</i>					<i>Fourth Quarter</i>				
AHR 122 A. C. & Refrigeration ....	5	0	6	8	AHR 124 A. C. and Refrigeration ....	3	0	6	6
ELEC 118 Applied Electricity .....	2	0	0	3	AHR 127 All Year Comfort Systems	3	0	2	4
MA 120 Plane Geometry .....	3	0	0	3	MECH 120 Sheet Metal and Duct Fabrica- tion .....	3	0	4	5
AHR 125 Principles of Air Conditioning	5	0	0	5	SOC 103 Manage- ment Procedures	3	0	0	3
DD 126 Applied Drafting .....	1	0	0	2					
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	16	0	6	21		12	0	12	18



# AIR CONDITIONING AND REFRIGERATION

## Course Descriptions

### AHR 121 ELEMENTS OF REFRIGERATION

An introduction to the field and terminology of refrigeration. Topics to be included will be the basic laws of refrigeration; heat and the methods of heat transfer; use and care of servicing tools, equipment, tubing, and fittings; compressors; refrigerants and temperature controls; types of refrigerants; special testing and servicing equipment. Shop practice will be given in basic refrigeration and such operations as tube bending, flaring, swaging, soldering, identification and proper use of fittings and basic service testing equipment. Prerequisite: None.

### AHR 122 AIR CONDITIONING AND REFRIGERATION

Discussions, demonstrations and shop practice on residential cabinets using conventional, hermetic and absorption systems. Cabinet care, controls, system maintenance, and system replacement will be stressed. The student will prepare estimates and submit bids on practical projects involving the major types of domestic heating and air conditioning systems. Prerequisite: AHR 121.

### AHR 123 AIR CONDITIONING AND REFRIGERATION

Theory and practice in the installation and service of commercial refrigeration systems. Topics to be studied are the following: Commercial cabinets, walk-in coolers, display cases, frozen food cabinets, condensers, coils, control valves, methods of installation, removal and repair of components, and trouble shooting of systems. The student will prepare estimates and submit bids on practical projects involving the major types of commercial refrigeration systems. Prerequisite: AHR 122.

### AHR 125 PRINCIPLES OF AIR CONDITIONING

Included in this course will be the history, theory, and factors covering air conditioning. Instruction will also include temperature measurement, air movement humidity, psychometric properties, comfort zone, duct systems, air diffusion, air cleaning zone, and testing instruments. Practice in computing system loads, equipment sizing and balancing and the use of charts and tables pertaining to refrigeration equipment. Prerequisite: AHR 121.

### AHR 126 ALL YEAR COMFORT SYSTEMS

The student studies and receives practice in servicing and installing gas burners, electric heating elements and controls. The applications of various heating devices in liquid heating and controls are studied. Basic principles of installing hot water and low pressure boiler controls, pumps, and coils are covered and suitable installations developed. Prerequisites: AHR 122, 125.

## AHR 128 AUTOMATIC CONTROLS

Types of automatic controls and their function in air conditioning systems. Included in the course will be electric and pneumatic controls for domestic and commercial cooling and heating; zone controls; unit heater and ventilator controls; commercial fan system controls; commercial refrigeration controls; and radiant panel controls. Prerequisites: ELEC 118, AHR 122.

## AHR 124 AIR CONDITIONING AND REFRIGERATION

Practice in selecting, installing and servicing of air conditioning systems and accessories. Self contained and remote systems, automotive air conditioning, pumps, wiring, refrigeration piping, air distribution, and comfort zone control, reversing valves, special types of thermostatic expansion valves, systems of de-icing coils are included in this course. Heat pump installations are practiced and emphasis will be placed on correct practices of installation and servicing techniques. Prerequisite: AHR 123.

## AHR 127 ALL YEAR COMFORT SYSTEMS

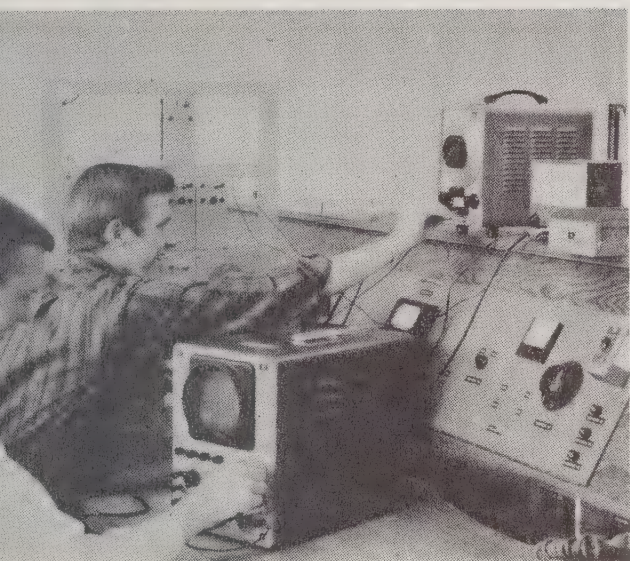
A continuation of AHR 126 with further study of the servicing and installation of oil fired heating equipment. The various types of burners and their methods of operation, installation, and servicing. Practice will be given in the servicing of this equipment and their control devices. Prerequisite: AHR 126.

## MECH 120 SHEET METAL AND DUCT FABRICATION

Properties of various types of sheet metal will be included in the study of sheet metal fabrication. Safety, sheet metal hand tools, cutting and shaping machines, fasteners and fabrication practices, layout methods and the development of duct systems. The student will lay out, develop, fabricate, and install complete duct systems under practical working conditions. Prerequisite: DD 126, MA 120.



# RADIO AND TELEVISION SERVICING



This curriculum is designed to fill the tremendous need for radio and television repairmen. With the number of televisions increasing every year, the need for individuals to service and install these receivers is also increasing every year. This particular curriculum will start with the basic information as a foundation on which the advance courses are established. The individuals enrolled in the school of radio and television repair will spend over half of their time in the laboratory with typical servicing and installation problems found in the field of work.

## OCCUPATIONAL OPPORTUNITIES

Radio Serviceman, Television Serviceman, Radio and Television Salesman, Installation, and Manufacturer Representative.

Course	Shop				Course	Shop			
	Class	Lab	Prac.	Credit		Class	Lab	Prac.	Credit
<i>First Quarter</i>					<i>Third Quarter</i>				
Ma 125 Electrical Math .....	5	0	0	5	Eln 124 Vacuum Tubes and Circuits .....	4	4	0	6
Elec 122 Direct and Alternating Current .....	7	8	3	12	Eln 125 Radio Receiver Servicing ....	2	0	6	4
Eng 101 Reading Improvement .....	2	0	0	2	Eln 126 Transistor Theory and Circuits .....	5	4	0	7
	14	8	3	19	Soc 103 Management Procedures .....	3	0	0	3
						14	8	6	20
<i>Second Quarter</i>					<i>Fourth Quarter</i>				
Eln 122 Vacuum Tubes and Circuits .....	5	10	0	10	Eln 127 Television Receiver Circuits and Servicing .....	10	0	15	15
Eln 123 Amplifier Systems .....	2	0	6	4	or				
Eng 102 Communication Skills .....	2	0	0	2	Eln 128 Television Receiver Circuits and Servicing .....	5	0	12	9
Soc 101 Human Relations .....	2	0	0	2	Elective (1) .....	5	0	6	7
	11	10	6	18		10	0	18	16
<b>ELECTIVE</b>									
ELN 129 Single Side Band Systems .....						5	0	6	7
ELN 130 Two-way Mobile Maintenance .....						5	0	6	7

# **RADIO AND TELEVISION SERVICING**

## **Course Descriptions**

### **ELEC 122 DIRECT AND ALTERNATING CURRENT**

A study of the structure of matter and the electron theory, the relationship between voltage, current and resistance in series, parallel and series-parallel circuits. Analysis of direct current by Ohm's law and Kirchhoff's law; sources of direct current potentials. Fundamental concepts of alternating current flow; a study of reactance, impedance, phase angle, power and resonance and alternating current circuit analysis.

Prerequisite: None.

### **ELN 122 VACUUM TUBES AND CIRCUITS**

An introduction to vacuum tubes and their development; the theory, characteristics and operation of vacuum diodes, semi-conductor diodes, rectifier circuits, filter circuits, triodes and simple voltage amplifier circuits.

### **ELN 123 AMPLIFIER SYSTEMS**

An introduction of commonly used servicing techniques as applied to monophonic and stereophonic high fidelity amplifier systems and auxiliary equipment. The operation and servicing of intercommunication amplifiers and switching circuits will also be taught.

### **ELN 124 VACUUM TUBES AND CIRCUITS**

A continuing study of tubes and circuits; the theory, characteristics, and operation of the tetrode and pentode tubes, voltage and power amplifiers, tunable RF amplifiers, oscillators and demodulator circuits.

### **ELN 125 RADIO RECEIVER SERVICING**

Principles of radio reception and practices of servicing; included are block diagrams of radio receivers, servicing techniques of AM and FM receivers by resistance measurements, signal injection, voltage analysis, oscilloscope methods of locating faulty stages and components, and the alignment of AM and FM receivers.

### **ELN 126 TRANSISTOR THEORY AND CIRCUITS**

Transistor theory, operation, characteristics and their application to audio and radio frequency amplifier and oscillator circuits.

### **ELN 127 TELEVISION RECEIVER CIRCUITS**

A study of principles of television receivers, alignment of radio and intermediate frequency amplifiers, adjustment of horizontal and vertical sweep circuits will be taught. Techniques of trouble shooting and repair of TV receivers with the proper use of associated test equipment will be stressed. Additional study of more specialized servicing techniques and oscilloscope waveform analysis will be used in the adjustment, trouble-shooting and repair of the color television circuits.

### **ELN 128 TELEVISION RECEIVER CIRCUITS**

This course, taught in conjunction with an elective will be a shortened version of ELN 127.

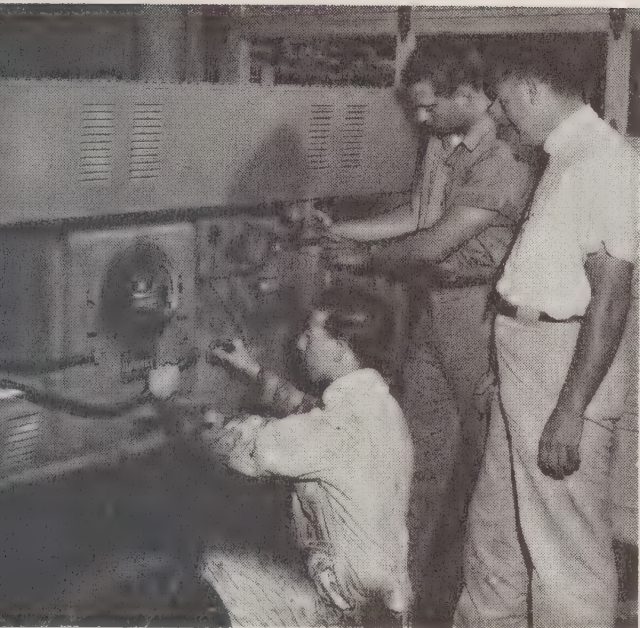
### **ELN 129 SINGLE SIDE-BAND SYSTEMS**

An introductory course of single side-band transmission system with carrier frequency or without and the associated balanced modulator or phasing system used to produce this type of transmission. Time will be allotted also to the necessary circuitry in the receiver to receive this type transmission.

### **ELN 130 TWO WAY MOBILE MAINTENANCE**

A course to acquaint the student with the theory and maintenance of fixed station and mobile station transmitters and receivers. Except for radio laws, sufficient information will be given to qualify the student to take the FCC second class radiotelephone license examination.





## HEAVY EQUIPMENT MAINTENANCE

This curriculum is constructed to give each student a foundation in diesel engine and hydraulic systems and go into the areas of electrical, steering, fuel, suspension, cooling, and lubricating. The various types of power trains will be considered.

The area of heavy equipment maintenance offers a wide variety of occupational opportunities. This program will give a student the basic knowledge and the industry will provide the opportunity to apply this knowledge in a specific area of work. Preventative maintenance for all types of heavy equipment will be stressed throughout the entire course. Some knowledge of the operation of heavy equipment will be presented.

### OCCUPATIONAL OPPORTUNITIES

Opportunities in heavy equipment maintenance will be found within Dealerships, Trucking Companies, Public Transportation Companies, General Contractors, Farm Implement Dealers, and industries that maintain heavy equipment.

	<i>First Quarter</i>	<i>Class</i>	<i>Lab</i>	<i>Shop</i>	<i>Total</i>	<i>Credits</i>
ENG. 101 Reading Improvement .....	2	0	0	2	2	
MATH 121 Mathematics .....	5	0	0	5	5	
PHYS. 104 Applied Physics .....	1	2	0	3	2	
HEV 110 Diesel Engine Theory and Practice .....	3	0	12	15	7	
	<hr/> 11	<hr/> 2	<hr/> 12	<hr/> 25	<hr/> 16	
<i>Second Quarter</i>						
ENG. 102 Communication Skills .....	2	0	0	2	2	
PHYS. 105 Applied Physics .....	1	2	0	3	2	
DD 121 Blueprint Reading .....	3	0	0	3	3	
HEV 111 Elem. Hydraulic Principles .....	2	3	0	5	3	
HEV 112 Heavy Equipment—Theory and Practice (Elec., fuel, and lubricating systems) .....	3	0	12	15	7	
	<hr/> 11	<hr/> 5	<hr/> 12	<hr/> 28	<hr/> 17	
<i>Third Quarter</i>						
WELD 121 Welding .....	2	0	3	5	3	
PHYS. 106 Applied Physics .....	1	2	0	3	2	
SOC. 101 Human Relations .....	2	0	0	2	2	
HEV 113 Heavy Equip.—Theory and Practice (Hydraulic systems, steering, suspension, braking, cooling systems) .....	3	0	12	15	7	
	<hr/> 8	<hr/> 2	<hr/> 15	<hr/> 25	<hr/> 14	
<i>Fourth Quarter</i>						
SOC. 103 Management Procedures .....	3	0	0	3	3	
HEV 114 Heavy Equipment—Theory and Practice (Power train systems) .....	3	0	6	9	5	
HEV 115 Heavy Equipment Service and Repairs .....	3	0	12	15	7	
	<hr/> 9	<hr/> 0	<hr/> 18	<hr/> 27	<hr/> 15	

# HEAVY EQUIPMENT MAINTENANCE

## Course Description

### HEV 110 DIESEL ENGINE THEORY AND PRACTICE

This course is designed as an introduction to the most common types of diesel engines. Each student will be subjected to the principles and theory of the diesel engine and required to work with several different types of engines. As the engines are rebuilt the proper use of hand tools and instruments will be taught. Standard procedures will be used in all engine work. Methods of checking the various parts of the engines will be employed.

### HEV 111 ELEMENTARY HYDRAULIC PRINCIPLES

Students will be introduced to the principles of hydraulic systems as they apply in the heavy equipment area. The theory of hydraulic systems must be understood thoroughly before the students can progress into actual work on hydraulic systems. Various aspects of heavy equipment will be used to demonstrate these principles and theories.

### HEV 112 HEAVY EQUIPMENT THEORY AND PRACTICE

This course continues from the engine course and will subject the student to the electrical system, fuel system, and lubricating systems. Each area will be treated as an individual unit. Each student will compare the various systems of Heavy Equipment. Preventive maintenance will be stressed in all areas. Types of fuel and the importance of pure and clean fuel will be taught. Tools, instruments, and machines related to these units will be presented.

### HEV 113 HEAVY EQUIPMENT THEORY AND PRACTICE

This course continues from the engine course and will advance the student into the actual hydraulic systems, steering, suspension, braking, and cooling systems. Each subject area will be treated as an individual unit taught separately. Each student will be required to study the difference in system on various pieces of equipment. Tools, machines, and instruments used in the various aspects of this work will be presented.

### HEV 114 HEAVY EQUIPMENT THEORY AND PRACTICE

This course is designed to go into all types of power trains in heavy equipment. A study of the theory of power trains will be presented and applications of maintenance and repair will give each student an opportunity to review various types of power trains. Actual experience in the operation of power trains will be required to give each student an overview of a variety of experiences. Special tools and instruments used in maintenance and repair of power trains will be presented.

### HEV 115 HEAVY EQUIPMENT SERVICE AND REPAIRS

This course is constructed to require students to utilize all tools, instruments, and machines for analysis of all aspects of service and repair. The procedures employed in service and repair will be the same as expected in the industry. Each student will be expected to show individual ability and initiative in determining the troubled area of heavy equipment.





## CARPENTRY AND CABINET MAKING

This curriculum is designed to subject a student to the fundamentals of carpentry work and the basic procedures of cabinet making. Students will begin with hand tools and progress into the woodworking machines found in a cabinet shop. The carpentry work will begin with the masonry foundation and progress to the finished building. Some consideration will be given to industrial buildings as compared to residential buildings.

Each student will have an opportunity to review the work of other skilled tradesmen such as plumbing and heating, electrical, masonry, and painting and finishing.

With the tremendous population growth and expanding industry this area will serve a need that has unlimited potential.

## OCCUPATIONAL OPPORTUNITIES

Occupational opportunities will be found with private builders, residential builders, general contractors, cabinet shops, and in many industries that maintain their own building.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Shop</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Shop</i>	<i>Credit</i>
<i>First Quarter</i>					<i>Third Quarter</i>				
DD 121 Blueprint Reading .....	3	0	0	3	DD 127 General Drafting .....	2	3	0	3
MA 121 Mathematics (Review) .....	5	0	0	5	MA 123 Mathematics (Trig.) .....	5	0	0	5
ENG 101 Reading Improvement ....	2	0	0	2	CAR 114 Plumbing .....	2	0	3	3
CAR 110 Cabinet-making I .....	5	0	10	8	CAR 115 Cabinet-making III .....	3	5	0	4
Totals .....	15	0	10	18	CAR 116 Carpentry II ....	3	0	4	4
<i>Second Quarter</i>					Totals .....	15	8	7	19
DD 122 Blueprint Reading .....	3	2	0	4	<i>Fourth Quarter</i>				
MA 120 Mathematics (Geometry) .....	3	0	0	3	CAR 117 Materials and Finishes ....	2	0	3	3
CAR 111 Masonry .....	3	0	5	4	CAR 118 Cabinet-making IV .....	2	0	6	4
CAR 112 Cabinet-making II .....	3	0	6	5	CAR 119 Carpentry III ....	4	0	11	7
CAR 113 Carpentry I .....	2	0	3	3	SOC 101 Human Relations .....	2	0	0	2
Totals .....	14	2	14	19	Totals .....	10	0	20	16

## **CAR 110 CABINETMAKING I**

This course is designed to introduce the student to hand tools used in a cabinet shop. After several projects with hand tools the student will be placed on each machine. Various types of wood will be used and identification of the various types of wood will be required.

## **CAR 111 MASONRY**

The student will study the various types of masonry construction and the types of masonry materials on the market today. Framing for chimney construction, ceramic floors and walls, flues will be presented. Form work for concrete walls, pillars, floors, foundations, driveways, and patios will be practiced. A study of the various mixtures of concrete and mortar mix will be studied.

## **CAR 112 CABINETMAKING II**

This course will go into the necessary framing for cabinet work. Students will be presented a study of built in cabinets and pre-constructed cabinet work. Built in book cases and special work will be presented.

## **CAR 113 CARPENTRY I**

This course will be presented as an introduction to the first steps necessary from the finished foundation to the complete framing of a building. Methods of framing entire walls before erection will be presented. Motion saving methods and overall planning of time will be presented. Size of nails and identification of nails will be studied.

## **CAR 114 PLUMBING AND HEATING SYSTEMS**

This particular course is designed to help the carpenter understand the types of plumbing and heating systems that are used in modern building construction. The requirements to special framing on the part of the carpenter will be practiced.

## **CAR 115 CABINETMAKING III**

This course will progress into the various woods used in cabinetmaking. Drawers, doors, hardware, and cornice work will be practiced. Methods of finishing and types of finishes will be studied.

## **CAR 116 CARPENTRY II**

In this course the students will study all types of roof construction. Each student will be required to cut and assemble all type of rafters. Students will be required to put on all types of shingles and prepare a roof for "built up construction". The students will also be required to study the framing square in order to figure the length of rafters and other materials.

## **CAR 117 MATERIALS AND FINISHES**

This course will present an identification and selection of materials. Methods and types of external finishes will be presented. Types of doors, windows, and external siding will be presented. Each student will be required to frame, stop and lock, doors and windows.

## **CAR 118 CABINETMAKING IV**

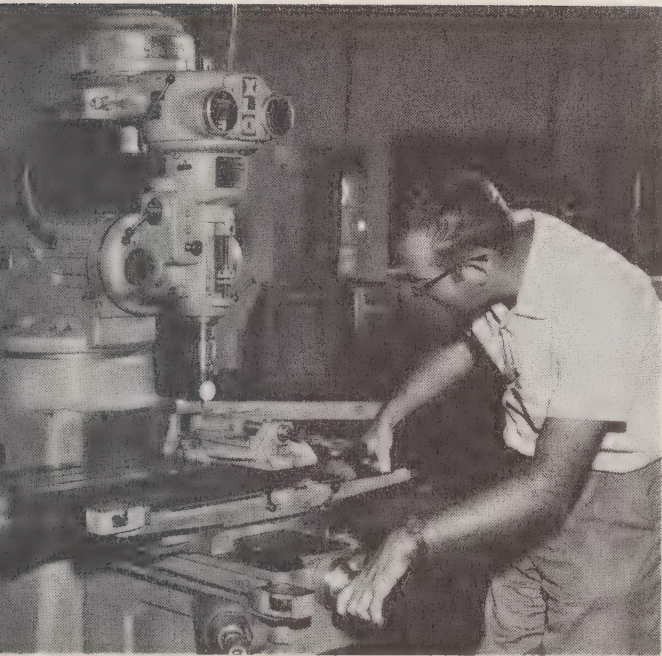
This is a study of the type of materials used on tops and other finished areas. Each student will study built in appliances such as stoves, ovens, dishwashers, and refrigerators. Finished cornice and standard measurements of all cabinet work will be presented.

## **CAR 119 CARPENTRY III**

This course will present the student with the finish work of carpentry. Types of baseboard, moulding, door facing, and framing and finishing stair cases will be presented. Each student will be subjected to a series of projects under close supervision that will require use of all finishing tools normally used by a carpenter. Clean work and self pride will have an emphasis in this course.



# TOOL AND DIE MAKING



The Tool and Die maker is the foundation man of many industries. This individual is highly skilled and possesses a tremendous depth of technical knowledge. This curriculum is designed to start an advanced machinist into the elementary requirement of tool and die making and progress into more complex dies, jigs and fixtures, gauges, and other areas.

This course will enable the advanced machinist to compare the machines found in a tool and die shop with those found in an average machine shop. Each student will be required to become highly proficient in the use of each machine used in Tool and Die Making. The related courses are designed to give the student an opportunity to advance his knowledge in mathematics, strength of materials, drafting, and hydraulics and pneumatics.

## OCCUPATIONAL OPPORTUNITIES

Occupational opportunities are found in metal working industries, government installations, machine shops, maintenance shops, and a wide variety of other industries that have repetitive production of products.

<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Shop</i>	<i>Credit</i>	<i>Course Title</i>	<i>Class</i>	<i>Lab</i>	<i>Shop</i>	<i>Credit</i>
<i>Fifth Quarter</i>					<i>Seventh Quarter</i>				
MECH 210 Machine Processes .....	3	0	12	7	MECH 212 Machine Processes .....	3	0	12	7
MA 203 Trigonometry .....	3	0	0	3	MECH 205 Strength of Materials .....	5	0	0	5
DD 227 Drafting..	3	6	0	5	DD 211 Mechanisms .....	5	0	0	5
Totals .....	9	6	12	15	PHY 205 Hydraulics and Pneumatics	3	0	0	3
<i>Sixth Quarter</i>					Totals .....	16	0	12	21
MECH 211 Machine Processes .....	3	0	12	7	<i>Eighth Quarter</i>				
MECH 204 Metallurgy .....	3	6	0	6	MECH 213 Machine Processes .....	3	0	12	7
DD 224 Advanced Blueprint Reading ....	3	0	0	3	DD 212 Tool Design .....	2	6	0	4
MA 204 Compound Angles and Curves .....	3	0	0	3	MECH 214 Special Problems .....	0	0	6	2
Totals .....	12	6	12	19	Totals .....	5	6	18	13

# TOOL & DIE MAKING

## Course Description

### MECH 210 MACHINE PROCESSES

This course is designed to introduce the student to the tools, instruments, and machines used in the tool and die shop. The student will compare the machines used in production with those used in tool and die making. The student will become familiar with jigs and fixtures and their applications pertaining to production machining. Each student will be subjected to a series of projects that will require extreme proficiency.

### MA 203 TRIGONOMETRY

A basic review of mathematics will form a foundation for a study of trigonometry of right triangles, vectors, coordinate systems, logarithmic and dimensional analysis. Applications to typical problems found in the tool and die shop will be presented and solutions will be found by using mathematics.

### DD 227 DRAFTING

An introductory course in drafting for students needing a knowledge of drawing principles and practices for reading and describing objects in the graphic language. The student is expected to gain basic skills in drawing with instruments, geometrical construction, freehand sketching, and describing objects orthographically with principal views and sections.

### MECH 211 MACHINE PROCESSES

Advanced operations of the tool and die shop, utilizing all machines. A study of shearing, punching, forming, and drawing dies will be presented. The student will receive instructions on gauging practices and its application to the finished product, and will become familiar with various types of gauging procedures. Each student will work individually on a series of projects, gaining proficiency and knowledge of the various types of tools and dies found in industry.

### MECH 204 METALLURGY

Properties of metals and various methods of changing these properties, classification of metals, powder metallurgy, and factors contributing to production and selection of metals will be presented. Chemical finishes, electroplating, and other methods of finishing or treating metals will be areas of study.

### DD 244 ADVANCED BLUEPRINT READING

A complete and thorough knowledge of tool and die prints will be required of all students. Industrial prints will be used in this course. The difference between production drawings or operation sheets and tools drawing will be presented. Assembly drawings as the piece fits into place will be broken down into each detail print required.

### MA 204 COMPOUND ANGLES AND CURVES

The application of trigonometry and geometry will be presented to solve compound angles. This course will use as many practical problems as possible to enable the student to work with typical problems in compound angles and curves without points of generation.



## MECH 212 MACHINE PROCESSES

This course will present a study of progressive dies typical of the operations found in the average industry. Step by step tooling used to transform raw material into a finished working part will be studied. Total utilization of all machines and instruments will be required. Application of hydraulic systems, air operated systems, pneumatic systems, and electronic controls and cycle devices will be presented. Emphasis will be placed on proper holding locations for machining and gauging finished parts.

## MECH 205 STRENGTH OF MATERIALS

A study of stresses and shears that occur in materials when subjected to tensile, compressive, and/or shearing forces. Stresses in thin walled cylinders, riveted and welded joints, shear and bending moment diagrams, deflection, eccentrically applied loads, torsion, and factors of column design will be emphasized.

## DD 211 MECHANISMS

This course consists of an application of mathematics and drafting room procedures to the solution of problems involving the principles of machine elements. A study of motions of linkages, velocities, and acceleration of points within a link mechanism, and layout methods for designing cams, belting, pulleys, gear and gear trains will be presented.

## PHY 205 HYDRAULICS AND PNEUMATICS

A basic theory of hydraulics and pneumatics systems and their combinations in various circuits. Function and basic design of circuits and motors, controls, electrohydraulic servo elements, synchro elements, and air operated systems will be presented. Automated systems of productions utilizing dies, tools, gauges, jigs and fixtures will be considered.

## MECH 213 MACHINE PROCESSES

This course will be used to review various processes of tool and die work, jigs and fixtures and gauging. Consideration of the production desired will be used to select the proper systems. Each student will work individually on different processes or systems utilizing all machines, instruments, and tools in tool and die making.

## DD 212 TOOL DESIGN

This course will enable the student to plan the process of production and isolate the areas that must be tooled for production. Cost of tools, die work, jig and fixtures, and gauging will be considered. Students will review available items from vendors and utilize standard bushing charts and other references. Typical tool design procedures will be employed and prints must reflect standard procedures.

## MECH 214 SPECIAL PROBLEMS

This course will be used to subject the student to special problems within local industries. Numerous field trips will be scheduled for individual and groups to review installation of systems, development of dies, tools, jigs and fixtures, and gauging. Each student will be required to follow one complete system from the design stage through to production. Special procedures of die casting, sand casting, shell molding, injection molding, hydro forming, and others will be presented.

## RELATED COURSES

### Course Descriptions

#### DD 126 APPLIED DRAFTING

A specialized course in drafting for the heating, air conditioning and refrigeration student. Emphasis will be placed on reading of blue prints that are common to the trade; blueprints of mechanical component; assembly drawings; wiring diagrams and schematics; floor plans and heating system plans including ducts, equipment layout plans, and shop sketches. The student will make tracings of floor plans and layout heating systems. Prerequisite: DD 122.

#### DD 305 DESIGN DRAFTING I

Basic design is introduced in the study of motion transfer mechanisms as they relate to power trains. Principles of design sketching, design drawing, layout drafting, detailing from layouts, production drawings, and simplified drafting practices constitute areas of study. Types and methods of specifying materials and workmanship are an integral part of the course.

#### DD 306 DESIGN DRAFTING II

Research to solve a problem in design by consulting various manuals, periodicals, and through laboratory experiments. A written technical report, preliminary design sketches, layout drawings, detail drawings, assembly and sub-assembly drawings, pictorial drawings, exploded pictorial assembly, patent drawings, and specifications are required as a part of the problem.

#### DD 307 GENERAL DRAFTING

An introductory course in drafting for students needing a knowledge of drawing principles and practices for reading and describing objects in the graphic language. The student is expected to gain basic skills in drawing with instruments, lettering, geometrical constructions, freehand sketching, and describing objects orthographically with principal views. Freehand sketching and orthographic reading are to be emphasized.

#### DD 308 GENERAL DRAFTING

The student continues the study of orthographic projection with applications to orthographic instrument drawing. Dimensioning procedures and practices are emphasized and the student is introduced to the "working drawing." Methods of describing complex objects with auxiliary views and/or sections and conventions are taught.

#### DD 309 PLANT LAYOUT

A practical study of factory planning with emphasis on the most efficient arrangements of work areas to achieve lower manufacturing costs. It includes the study of sample layouts for small and medium-sized plants, layout fundamentals, selection of production equipment, materials, handling equipment, and the effective management of men, money, and materials in a manufacturing operation.

#### DD 311 MECHANISMS

This course consists of mathematical and drafting room solutions of problems involving the principal machine elements. Included is a study of motions of linkages, velocities, and acceleration of points within a link mechanism, and layout methods for designing cams, belting, pulleys, gears and gear trains.



## DD 312 DESCRIPTIVE GEOMETRY

This is a study of the graphical analysis of space problems. The problems deal with practical design elements involving points, lines, planes, connectors, and a combination of these. Also included are problems dealing with solid geometry theorems. Where applicable, each graphical solution shall be accompanied by the analytical solution and visualization shall be stressed on every problem.

## ELN 301 INDUSTRIAL CONTROLS

Industrial controls is the study of modern methods of controlling machinery by electronic circuitry. Machinery controls and electronic mechanisms that automatically operate machines will be studied. Types of motors, generators, control signals and devices, thyratrons, gates, switches, and servomechanism circuits are major areas of study.

## ENG 101 READING IMPROVEMENT

A concentrated effort to improve the student's ability to comprehend what he reads by training him to read more rapidly and accurately. The tachistoscope is used for class drill to broaden the span of recognition, to increase eye coordination and word group recognition, and to train for comprehension in larger units. Reading faults of the individual are analyzed for improvement, and principles of vocabulary building are stressed.

## ENG 102 COMMUNICATION SKILLS

Development of the trainee's ability to communicate effectively with other individuals through the medium of good language usage in speaking and writing, to think more clearly, and to reason more forcefully in work problems pertaining to his job.

## ENG 301 READING IMPROVEMENT

A concentrated effort to improve the student's ability to comprehend what he reads by training him to read more rapidly and accurately. The tachistoscope is used for class drill to broaden the span of recognition, to increase eye coordination and word group recognition, and to train for comprehension in larger units. Reading faults of the individual are analyzed for improvement, and principles of vocabulary building are stressed. Prerequisite: None.

## ENG 302 COMMUNICATIVE SKILLS: ENGLISH

Designed to aid the student in the improvement of self-expression in both business and technical compositions. The approach is functional with emphasis on grammar, diction, sentence structure, punctuation, and spelling. Intended to stimulate students in applying the basic principles of English grammar in their day-to-day situations in industry and social life.

## ENG 303 COMMUNICATIVE SKILLS: TECHNICAL WRITING

The basic fundamentals of English are utilized as a background for the organization and techniques of modern technical writing. Exercises in developing typical technical reports, using writing techniques and graphic devices, are completed by the students. Practical application in the preparation of a full-length technical report is required of each student at the end of the term.

## ENG 304 COMMUNICATIVE SKILLS

Technical speech is to develop the speaking skills with emphasis upon the dual role of communications as both a speaking and listening skill. Stress is also placed upon the growth in poise and confidence on the part of the student. Practice is provided through individual speeches and group discussion. Recordings are made of the student's voice and used as an aid in speech development. Prerequisite: ENG 302.

## ISc 102 INDUSTRIAL ORGANIZATIONS

Methods, techniques, and practices of modern management in planning, organizing, and controlling operations of a manufacturing concern. Introduction to the competitive system and the factors constituting product cost. Prerequisite: None.

## ISc 301 INDUSTRIAL ORGANIZATION AND MANAGEMENT

Study of organizational structure, operational and financial activities, including accounting, budgeting, banking, credit and industrial risk, forecasting of markets, selection and layout of physical facilities; selection, training and supervision of personnel as found in typical industrial organizations.

## ISc 302 QUALITY CONTROL

The broad viewpoint of the subject is covered including basic principles and techniques used to effect better control, cost saving, and an efficient quality control department. Specific subjects considered include the functions, responsibilities, structure, costs, reports, records, personnel and vendor-customer relationships of the quality control department and the principles used in sampling inspection, process control and tests for significance. Practical methods for application are stressed.

## ISc 303 MOTION STUDY

A course designed to prepare the student for solving the ever-increasing need of greater labor productivity in industry. Types of methods studies and the application of each are explored. Included is a study of process charts, analysis sheets, and the systematic consideration of the factor of production in sequence. The various uses of time study in a manufacturing plant, the qualifications of a time study man, the principles of work simplification, skill and effort rating, and standard data are studied and applied.

## ELEC 122 DIRECT AND ALTERNATING CURRENT

A study of the electrical structure of matter and the electron theory, the relationship between voltage, current and resistance in series, parallel and series-parallel circuits. Time will be devoted to the analysis of direct current circuits by Ohm's law and Kirchhoff's law; time will be allotted for the study of sources of direct current potentials. Fundamentals concepts of alternating current flow; a study of reactance, impedance, phase angle, power and resonance. Time will be allotted for alternating current circuit analysis.

## ELEC 118 APPLIED ELECTRICITY

The use and care of electrical test instruments and equipment used in the servicing of refrigeration electrical apparatus. Meter principles and procedures of trouble shooting of the various electrical devices used in air conditioning, heating, and refrigeration equipment. Included will be transformers, motors, starting devices, switches, electrical heating devices, and wiring. Prerequisite: ELEC 117.



### **ELEC 117 BASIC ELECTRICITY**

A study of the basic theories of electricity, types of electricity, methods of production, and the transmission and transforming of electricity. The course will include the following topics: Electron theory; electricity by chemical action, friction and magnetism; induction, voltage, horsepower, amperage, wattage, transformers, wiring and resistance. Prerequisite: None.

### **ELEC 301 ELECTRICAL MACHINERY**

A course in the basic understanding and application of electricity to modern industrial machinery. Included is a study of DC motors, motor controls and protecting devices, transformers, and the industrial applications of this equipment.

### **ELEC 309 ELECTRICAL FUNDAMENTALS**

This course will introduce the student to direct current theory and circuits as an aid to programming data processing equipment. An introduction to simple alternating current circuits will also be given. Prerequisite: None.

### **DD 121 BLUEPRINT READING**

Interpretation and reading of blueprints used by industry. A course designed to develop the ability to read and interpret blueprints, charts, instruction and service manuals, and wiring diagrams. Information on the basic principles of lines, views, dimensioning procedures, and notes. Prerequisite: None.

### **DD 122 BLUEPRINT READING**

Interpretation and reading of blueprints used by industry. Information on the basic principles of the blueprint; lines, views, dimensioning procedures and notes. Prerequisite: None.

### **DD 123 BLUEPRINT READING**

Further practice in interpretation of blueprints as they are used in industry; study of prints supplied by industry; making plans of operations; introduction to drafting room procedures; sketching as a means of passing on ideas, information, and processes. Prerequisite: DD 122.

### **SOC 101 HUMAN RELATIONS**

The purpose of the course is to help the student acquire greater understanding of his relations to other persons through learning and applying some of the basic principles of human psychology. The problems of the individual and his work situation are studied in relation to the established organization of modern business and industry and in relation to government practices and labor organization, with special emphasis on the operating responsibilities of good management.

### **SOC 103 MANAGEMENT PROCEDURES**

Management procedures are developed to familiarize the prospective businessman with the many important functions that must be carried on in the operation of a small business or enterprise. An introduction to the business world, problems of small business operation, basic business law, business forms and records, financial problems, ordering and inventorying, layout of equipment and offices, methods of improving business, and employer-employee relations are some of the subjects studied.

### **SOC 301 HUMAN RELATIONS**

Principles of inter-personal relations including a consideration of motivation, feelings, emotions, and learning with reference to their applications to on-the-job situations; personal and group dynamics and self-adjustment.

## SOC 302 ECONOMICS

The fundamental principles of economics including institutions and practices by which people gain a livelihood. Included is a study of the laws of supply and demand and the principles bearing upon production, exchange, distribution, and consumption both in relation to the individual enterprise and to society at large.

## SOC 104 SALES AND COMMUNICATION

A course to improve the serviceman's ability to communicate more effectively. Instruction will be given in preparing reports, communication principles, and salesmanship. Prerequisite: None.

## MA 120 PLANE GEOMETRY

The student will be given the patterns of traditional geometric concepts in a new approach by developing the normally innate abilities of the individual to visualize spatial problems. This course will include the following: Principles of plane geometry, plane geometric figures, general theorems, pythagorean theorem, the circle, geometric construction, area of plane figures, volume of solids, and geometric principles applied to shop operations. Prerequisite: None.

## MATH 121 MATHEMATICS

Review of fundamental number concepts, operations, and systems of measurement. Mathematical situations dealing with common and decimal fractions, powers and roots, ratio and proportions, and percentages. A study of algebraic and geometric principles and concepts needed in understanding calculations, formulas, solution of equations, and selected plane and solid geometric forms. Prerequisite: None.

## MATH 122 MATHEMATICS

Foundation for a better understanding of applied mathematics. This course is a review of simple mathematical situations dealing with fractions, decimals, conversion of one to the other, short methods and checks, percentages and applications, ratio and proportion, and powers and roots. It will also present an introduction to axiomatic solution of equations and includes special products and factoring, algebraic fractions and their applications to equations. Prerequisite: None.

## MATH 123 MATHEMATICS

Fundamental geometric concepts and construction of plane and solid figures, surface and volume measurements, and related problems; introduction to trigonometry of the right triangle. Introduces gear ratio, lead screw and indexing problems with emphasis on application to the machine shop. Practical applications and problems will furnish the trainee with experience over the wide range of geometric propositions and trigonometric relations in shop problems, concluded by an introduction to compound angle problems. Prerequisite: MATH 122.



## MA 124 ALGEBRA

The fundamental concepts and operations of basic algebra. The historical background and evolution of the number system is introduced and related to its present day use. Basic operations of addition, subtraction, multiplication, and division are covered in depth and related to the solution of various algebraic functions. The solution of first order equations, use of letters and signs, grouping, factoring, exponents, and the setting up of ratios, proportions and variations. Those laws, axioms, and postulates, relative to basic algebra are stated and discussed in detail. This course embodies solutions of algebraic equations graphically as well as algebraically. It presents functions of sets of numbers by pictorial graphs showing the relationships of number sets. In the solutions of simultaneous equations methods of addition, subtraction, substitution, and comparison are applied. In exponents, definitions of base, power, and exponent are included.

## MA 125 ELECTRICAL MATHEMATICS

To acquaint the student with the fundamental concepts of algebra; basic operations of addition, subtraction, multiplication and division are covered; time is spent in the solution of first order equations, use of letters and signs, grouping, factoring, exponents, ratios, proportions. Solution of equations both algebraically and graphically; a study of logarithms and use of tables. An introduction to trigonometric functions and their application to right triangles; a study of vectors for use in alternating current.

## MA 301 TECHNICAL MATHEMATICS

The real number system is developed as extensions of natural numbers, integers, and rational numbers. Insight into the processes of arithmetic and algebra is provided. Additional topics include sets, equations, number bases, number lines, coordinate systems, trigonometry of right triangle, vectors, dimensional analysis, and the derivative.

## MA 302 TECHNICAL MATHEMATICS

Algebraic operations are applied to linear, quadratic, and polynomial functions and special equations of second degree. Complex numbers are introduced and the study of the derivative is continued. Selected applications involving rates of change, maxima and minima, approximation, areas, and volumes are considered.

## MA 303 TECHNICAL MATHEMATICS

Ideas of algebra are used in a study of trigonometric, logarithmic, and exponential functions. Selected applications of calculus reinforce this approach. Polar coordinates are introduced and their applications expanded. Complex numbers, vectors, coordinate systems and their applications constitute other areas of study.

## MA 304 TECHNICAL MATHEMATICS

Algebra and fundamental ideas of calculus are used in the study of plane and solid geometric figures. Topics include curve sketching, maxima and minima, plane areas, curve lengths, volumes of solids, and surface areas. Some applications of first order differential equations and series representations of selected important functions are presented.

## MECH 111 OXYACETYLENE WELDING

Basic welding procedures and practice. The trainee will gain experience in the gas welding of small parts and tools. This course will present gas welding as it may be used by the machinist in the repair of tools and equipment.

## WELD 112 WELDING

Demonstrations by the instructor and practice by students in the welding shop. Safe and correct methods of assembling and operating the welding outfit will be emphasized. Practice will be given for surface welding, bronze welding, silver brazing, and flame cutting methods applicable to mechanical repair work. Prerequisite: None.

## WELD 121 WELDING

The various processes used for joining materials by welding are discussed. Lecture, demonstrations, and practice cover the oxyacetylene and arc welding processes, filler metals used, gases, currents, weldability of metals. Instruction is given in the set-up and safe operation of oxyacetylene welding apparatus. Students prepare joints by both hand and machine cutting with the oxyacetylene torch. Prerequisite: None.

## WELD 122 WELDING

Continuation of WELD 121 with practice given in arc-welding using A.C. transformer and D.C. motor generator welding machines. A study is made of the correct welding heats, polarities and electrodes to use when welding various materials and alloys. Prerequisite: WELD 121.

## CHEM 301 GENERAL CHEMISTRY

This course involves a study of the physical and chemical properties of substances, chemical changes, elements, compounds, gases, chemical combinations, weights and measurements, theory of metals, acids, bases, salts, solvents, solutions, and emulsions. In addition, a study is made of carbohydrates, electro-chemistry, electrolytes and electrolysis in their application of chemistry to industry. Prerequisite: MA 301.

## PHY 104 APPLIED PHYSICS

Introductory course in physics and its applications. Covers systems of measurement, theory of matter, properties of solids, liquids, and gases. Prerequisite: None.

## PHY 105 APPLIED PHYSICS

Basic principles of electricity, types of electricity, and its production, transmission, and transformation. Such factors as the electron theory, electrical measurement, magnetism, electromagnetism, and the magnetic effects of electricity constitute major areas of study. Prerequisite: PHY 104.

## PHY 106 APPLIED PHYSICS III

Physical principles of force, energy, work, and power; equilibrium, and the laws of motion; the principles of machines, mechanical advantages, and transmission of power in practical applications. The use of vectors, and graphical presentations constitute a vital part of this course. Prerequisites: PHY 104, MA 121.

## PHY 301 PHYSICS

A fundamental course which covers several of the basic principles of physics. The divisions included are solids and their characteristics, liquids in motion, gas laws and their applications. Laboratory experiments and specialized problems dealing with these topics are also an integral part of this course.



### PHY 302 PHYSICS: WORK, ENERGY, POWER

The major areas covered in this course are work, energy, and power. Instruction includes such topics as statics, force, center of gravity, and dynamics. Units of measurement and their application are also a vital part of this course. A practical approach is used in teaching students the use of essential mathematical formulas.

### PHY 303 PHYSICS

This course covers the basic theories of electricity, types of electricity, methods of production, and transmission and transforming of electricity. Such factors as the electron theory, electricity by chemical action, electricity by friction, electricity by magnetism, induction voltage, amperage, resistance, horsepower, wattage, and transformers are major parts of the course.

### PHY 304 PHYSICS: LIGHT, SOUND, POWER

The major areas covered in this course are light, sound, and power. Instruction includes such topics as center of gravity, and dynamics. Units of measurement and their application are also a vital part of this course. A practical approach is used in teaching students the essential mathematical formulas.

### PHY 305 HYDRAULICS AND PNEUMATICS

The basic theory of hydraulic and pneumatic systems and their combinations in various circuits. Function and basic design of circuits and motors, controls, electrohydraulic servo elements, plumbing, filtration, accumulators, and reservoirs, constitute major areas of study.

### PHY 306 APPLIED MECHANICS

Advanced study based on the concepts and principles of statics and dynamics. Parallel concurrent and non-concurrent force systems are studied in both coplanar and non-coplanar situations. Also presented are the concepts of centroids and center of gravity, moments of inertia, and the fundamentals of kinetics.

### MECH 112 WELDING

Demonstration by the instructor and practice by student in the welding shop. Safe and correct methods of assembling and operating the welding outfit will be emphasized. Practice will be given for surface welding, bronze welding, silver brazing, and flame cutting methods applicable to mechanical repair work. Prerequisite: None.

### MECH 301 MATERIALS, TOOLS, AND PROCESSES

An overall view of the methods and procedures used to transform the raw material into a finished product. Characteristics of metals, woods, and plastics and how these characteristics affect the selection and use of materials and methods of production in the manufacture of an object. Unit production system, sand casting, forging and allied processes, welding, sheet metal working processes, and woodworking processes constitute areas of study.

### MECH 304 METALLURGY

Properties of metals and various methods of changing these properties, classifications of metals, powder metallurgy, and factors contributing to production and selection of metals for use are areas of study.

### MECH 305 STRENGTH OF MATERIALS

A study of the stresses and strains that occur in materials when subjected to tensile, compressive, and/or shearing forces. Stresses in thin-walled cylinders, riveted and welded joints, shear and bending moment diagrams, deflection, eccentrically applied loads, torsion, and factors of column design.



## MECH 306 MACHINE PROCESSES

An introductory course designed to acquaint the student with basic hand tools, safety procedures and machine processes of our modern industry. It will include a study of measuring instruments, characteristics of metals and cutting tools. The student will become familiar with the lathe family of machine tools by performing selected operations such as turning, facing, threading, drilling, boring, and reaming.

## MECH 307 MACHINE PROCESSES

A continuation of experience begun in MECH 306 with advanced operations on the lathe, drilling, boring and reaming machines. The student will become acquainted with the milling machine in theory and practice. A thorough study will be made of the types of milling machines, cutter, jig and fixture devices, and the accessories used in a modern industrial plant. Safety in the operational shop will be stressed at all times.

## MECH 309 MACHINE PROCESSES

A study dealing with the newer concepts of work handling and automatic machining processes. A large portion of the theory units will cover topics such as methods of chipless production and new techniques in metal forming. An analysis of high energy forming, ultrasonic machining, electrolytic metal removal, chemical milling, numerical controls, and simplified building block numerical control systems.

## MECH 310 PHYSICAL METALLURGY

This is an introductory course in metallurgy. It will present an analysis of the structure of metals and alloys, atomic structure, nuclear structure, and nuclear reactions. Topics undertaken for study will be solid (crystalline) structures, methods of designating crystal planes, the liquid and vapor phases, phase diagrams, and alloy systems.

## MECH 312 PRACTICAL AUTOMATION

A comprehensive study of automation as it is interpreted and practiced by American industry of today. The fundamentals of automation and the results of this automation on industrial productivity, labor supply and demand, equipment and processes are topics which will be undertaken. Students will be presented with problems encountered when installing an automated system.

## MECH 313 PRODUCTION PLANNING

A study of day-to-day plant direction is subdivided for analysis into forecasting, product planning and control, scheduling, dispatching, routing, and inventory control. Case histories are discussed in the classroom for clinical analysis and courses of corrective action are developed.

## MECH 314 TOOL ENGINEERING

An introduction to the problems of tool engineering with emphasis on such topics as planning the processes of production, development and design of the necessary tools, and finally the integration of available manufacturing facilities. A practical analysis and comparison of the use and cost of tools, jigs and fixtures, dies, molds, and gages as they are utilized in our modern day manufacturing and production methods.





